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Harry Bouchard
Frank C. Caldwell
Walter B. Carver
Henry W. Chadbourne
Robert L. Daugherty
Roland P. Davis
Francis M. Dawson
James J. Doland
John E. Emswiler
Charles H. Fessenden
Francis S. Foote
Robert C. H. Heck
James D. Hoffman
Hugh E. Keeler
H. J. Macintire
Frank P. McKibben
Samuel Martin, Jr.
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Herbert H. Scofield
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A CHALLENGE

By JAMES W. PARKER, *Chief Engineer*, Detroit Edison Co.,
Vice Chairman, Committee on Meetings and Program, American Society of Mechanical Engineers

In spite of all the talk of the importance of English to engineers, men are being graduated from the engineering colleges with insufficient training for the adequate expression of the thought and observation that constitute the substance of their day's work. The English departments of the engineering colleges apparently are not disposed to deny this assertion; whether because of their rather close knowledge of the qualifications of the men being graduated from year to year or because some of the teachers have themselves attended the technical sessions of engineering societies, I will not attempt to say.

One inevitably asks the question: What is wrong with the existing method? If everyone recognizes the importance of the training, why are the results so often disappointing?

For one thing, the subject is too important to be treated as a minor course of study as it now very largely is. Rather must it become a major subject, a part of the fundamental education of the engineer. Very likely the students in college have not the right attitude, but it is not strange that they fail, at the time, of a real comprehension of the vital importance of this training in its bearing on their subsequent careers after graduation; for they are led to believe by the attitude of engineering teachers that their chief interest lies in certain engineering fundamentals. On these practicalities an overwhelming emphasis is placed. Teachers in the fundamental engineering courses too often do not require that the student learn to make an adequate restatement of the subject matter imparted to him in the course. The teachers themselves are not always conspicuous in their capacity for convincing, logical statement, either in the classroom or in public gatherings.

In other words, there is a disposition to treat English as a side issue, very necessary and very desirable it is true, but nevertheless a side issue. The student is not required to look upon whatever facility he may have acquired in English composition or in oral statement as a necessary tool he must use in carrying on his engineering work; and herein, I think, lies the chief error.

It is my belief that this attitude of the engineering faculties must be changed. At the forthcoming S. P. E. E. Summer School

in English, to be held at Ohio State University this summer, the teachers of engineering subjects should themselves be in attendance, with a liberal sprinkling of deans of engineering colleges. That the school should be considered a school only for teachers of English and public speaking would, it seems to me, prove the truth of the very condition to which I am objecting.

VISUAL EDUCATION EXPERIMENTS GIVE TANGIBLE RESULTS

By J. M. MILLER

Rice Institute

Back in the days of the stereoscope and the carbon arc projector space in these pages was given to the discussion of visual aids in education. Now that we have the brilliantly lighted stereopticon, the daylight moving pictures and 16 mm. as well as 35 mm. sound-on-film pictures much better and more inclusive materials should be generally used.

It is hard to imagine text-books in engineering without illustrations. Such illustrations as have been appearing in text-books should be put into motion to make them more impressive and effective. The public school systems in some of our larger cities have annual appropriations of over $100,000 for visual aids; industrial concerns are producing educational films in great numbers; educators in many other professions illustrate their lectures by motion pictures. Activities in engineering education, which permit the use of visual aids, should be encouraged and successful experiments be made common knowledge.

Interesting results have been obtained in the use of animated motion pictures covering the fundamental conceptions of descriptive geometry. The pictures thus used were 16 mm. size in eight reels of approximately two hundred feet each. In order definitely to test the instructional value of the films a class of 126 students was divided equally into two sections without consideration of the aptitudes of the different students. Lectures of equal duration were given to the two sections. The lectures to the one group were illustrated by films but to the other group no films were used. The two sections were given the same daily tests at the same time and place. The response to the tests justified grades which were averaged as follows:

Average Grades

Test Numbers	1	2	3	4	5	6	7	All
Section "A" shown films	80.4	83.1	69.8	55.4	88.9	66.6	81.5	75.07
Section "B" no films...	77.3	79.5	67.0	52.5	79.5	62.2	53.0	67.29

It may be seen that those students who had the advantage of studying the films ranked considerably higher in response to the tests than did the others. Having studied the films seems to have given the one section an 8.78 per cent advantage over the other section.

Then to determine whether or not the one section contained better students than the other, the same films were shown to the "B" section and test grades made after both sections had studied the pictures were tabulated. In six of these fourteen tests better grades were made by section "A" while better grades were made by section "B" in eight of the tests. The averaging of grades made over those latter fourteen tests gave no indication of one section being more apt than the other, as the grades, for all practical purposes, would be considered equal. Section "A" average was 46.51 and the average of section "B" was 46.35.

About eight weeks after the class had completed the study of the films a questionnaire was circulated to learn the opinions of the students. Results of that questionnaire have been tabulated as follows:

Question	Number of Replies		
	Yes	Indifferent	No
Did the films studied earlier in the year help you in solving the problems which they explained?	107	5	7
Did they give you a better idea of the subject generally?	113	2	2
Did seeing the film aid you in analyzing other problems of the course?	114	7	3
Are you better able to "visualize" movements of points, lines and planes than if you had not seen the films?	91	5	20

The novelty of the presentation was doubtless responsible for a considerable number of the affirmative replies. The true educational value is probably less than indicated by these figures but it is surely appreciable. There can be no doubt that the method of presentation was of general interest to the students.

The study of the animated motion pictures must have been largely responsible for the 8.78 per cent difference in grades first above mentioned. With such results possible and with a vast array of desirable equipment available many more engineering subjects should be explained through the medium of motion pictures and such pictures and attending benefits made available to all.

SALARIES OF ELECTRICAL ENGINEERING GRADUATES

ANALYZED IN ETA KAPPA NU SALARY SURVEY OF 1930

BY MAYNE S. MASON, *President*, 1929–30

AND

J. A. UMHOEFER, *Executive Secretary*, 1928–31

National Executive Council, Eta Kappa Nu

250 Park Avenue, New York City

Professional success can no more be measured in terms of dollars than in terms of any other single criterion. For salary is merely one index of success. It is, however, one basis that can be evaluated definitely and upon which comparisons can be made.

Fully realizing the limitations of such salary comparisons, but also recognizing their importance, Eta Kappa Nu, national honorary electrical engineering fraternity, conducted a salary survey of its membership in 1930. Under the direction of the National Executive Council, 3,580 survey cards like that shown in Fig. 1 were sent on April 30, 1930, to the members who had been initiated while undergraduates in college. There were 1,841 replies, representing a 51.4 per cent response. The returns were representative of the entire country. A wide range of professional work was indicated; consequently the results are to be taken as salary information on men whose undergraduate training was in electrical engineering and not as pertaining only to electrical engineers by profession in 1930.

An instruction sheet, supplied with the survey card, listed twelve types of organizations, seven types of departments or positions, five geographical sections and four sizes of cities. Each member was asked to classify himself under the appropriate heading of each classification. Salary was defined as yearly earnings (salary and commissions only—not total income—as of July 1 of each year, except that "present" salary to be reported was the salary at the time of sending in the survey card.

MEDIAN VALUES USED IN CURVES

The salary progress of each class is presented in Fig. 2. All these curves show median * values. It is believed that the use of

* The median is the middle number and has as many numbers larger than itself as it has numbers smaller than itself.

ETA KAPPA NU SALARY SURVEY

Class of (Year).....

Years Since Graduation	Salary Per Year	Type of Organization	Department or Position
(Initial) 0			
2			
5			
10			
15			
20			
Present			

If in active military or naval service during the World War, please state the number of months so spent .....

Graduate Study

Did you take any engineering graduate work?.....

Any non-engineering graduate work?.....

If the latter, in what subject?.....

Did you receive a graduate degree?.....

If so, please name it.....

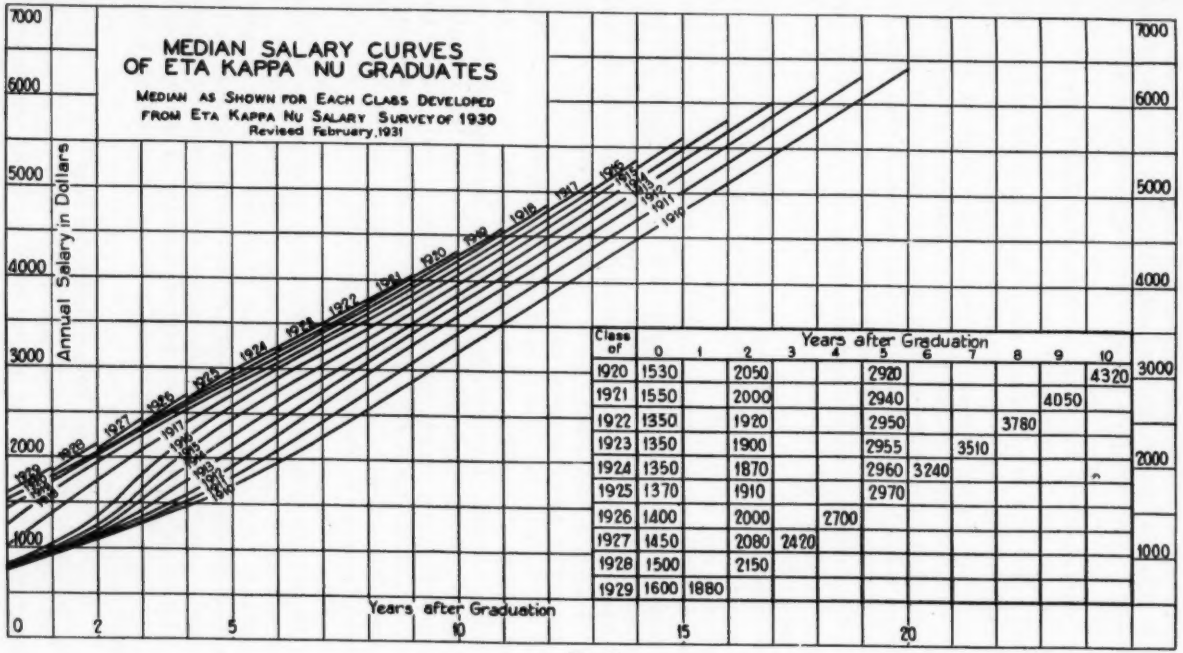
Present Location

Geographical Section.....

Size of City.....

(Please enter special remarks on the reverse side of this card)

Fig. 1



Class of	0	1	2	3	4	5	6	7	8	9	10
1920	1530		2050			2920					4320
1921	1550		2000			2940				4050	
1922	1350		1920			2950			3780		
1923	1350		1900			2955		3510			
1924	1350		1870			2960	3240				
1925	1370		1910			2970					
1926	1400		2000		2700						
1927	1450		2080	2420							
1928	1500		2150								
1929	1600	1880									

FIG. 2

medians rather than averages tends to give a more nearly true picture of progress, in that medians are not unduly affected by the extremely high or extremely low salaries of a few individual members.

A progress curve for each class has been shown (Fig. 2) in preference to a static curve of all classes at the time of the survey (1930). However the median salary curve in 1930 can be obtained by drawing a curve through the last points of all the progress curves (which points represent median salaries for each class in 1930). Such a curve is shown in Fig. 5, marked "All Replies." Similarly the median salary curve in any other year, say 1925, may be drawn through the 1925 points on the progress curves. For the classes of 1920 to 1929, the complete progress curves are not shown due to the fact that they lie extremely close to one another but data from which these curves may be plotted are shown in Fig. 2 in tabular form.

A significant point to be noted in this method of presentation by individual classes is that while the curve of salaries in 1930 of all classes (Fig. 5, "All Replies") would indicate that a knee had been reached between seventeen and twenty years after graduation, the progress curves of the individual classes (Fig. 2) show this conclusion to be incorrect. The median for every class from 1910 to 1929 has continued to rise with each additional year from the date of graduation in such a way that *in 1930 not one class had reached the knee of its salary progress curve.*

It will be noted also that in most cases the curves for each class from 1910 to 1929 (Fig. 2) are higher than the curves of any preceding classes. However, the increment between the various classes for a given number of years after graduation becomes much less with the later classes than it was with the early ones. For example: At ten years after graduation the difference in salaries between the classes of 1910 and 1915 was approximately 800 dollars; between the classes of 1915 and 1920, this difference was about 300 dollars.

The fact that the median salary of each class graduated from 1910 to 1920 (for a given number of years after graduation) was higher than the median salary of any preceding class was probably due to the increases made necessary in the general wage scale by the increased cost of living. Possibly part of the increase was due also to a better recognition on the part of industry of the work done by engineers. Several other minor factors contributed to the steady climb.

Unusual Trend Caused by War

The progress curve for the class of 1916 from two to five years after graduation indicates a distinct trend, probably caused largely

by World War conditions. At two years after graduation, *i.e.*, in 1918, the slope of the curve increases rapidly and this steeper curve continues until approximately 1920, four years after graduation. This same effect is noticeable, though to a less marked degree, for the class of 1915 during these same years. This may indicate that the classes of 1915 and 1916, particularly the latter, were qualified by their few years' experience after graduation to take advantage of the opportunities offered them to assume responsibility in the hectic days of the war. This war influence seems to have caused no significant change in salaries of classes graduated earlier than 1915, but it may have been responsible for the higher salaries of the class of 1917 in these same years.

The average rate of increase of the median salaries, while varying somewhat for each class, is approximately 280 dollars per year.

Analyzing Salaries by Industries

The total replies from the men who supplied salary data for this survey were divided by industries as follows:

Electrical Manufacturing (including Communications Manufacturing) with 5,000 or more employees	431
Electrical Manufacturing (including Communications Manufacturing) with fewer than 5,000 employees	167
Other Manufacturing	144
Electric Light and Power	329
Communications (not Manufacturing)	412
Any other type of organization	358

The first five of these industries provided employment for 1,483, or 80.5 per cent, of the total of 1,841 men replying.

For the large electrical manufacturing group a family of curves was developed which traces the salary progress (from graduation up to the time of the 1930 survey) of men who were in this group in 1930 and who had been graduated from 1915 to 1929 inclusive (Fig. 3). Replies were not numerous enough to warrant the development of curves for the earlier classes.

The salary progress of men engaged in communications work (not manufacturing) is demonstrated by classes in the medians of Fig. 4.

These families of curves refer to men who were in the designated type of organization at the time of the survey. They do not necessarily represent progress in a particular industry as the route of advancement to the 1930 position may have included many other types of work. For the classes of 1920 to 1929, inclusive, only the salaries for the years 1929 and 1930 are shown on the families of curves (Figs. 2, 3 and 4) while the earlier figures

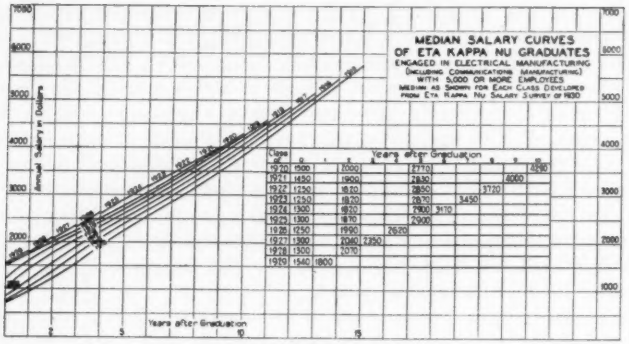

MEDIAN SALARY CURVES
OF ETA KAPPA NU GRADUATES
ENGAGED IN ELECTRICAL MANUFACTURING
(INCLUDING COMMUNICATIONS MANUFACTURING)
WITH 5,000 OR MORE EMPLOYEES
MEDIAN AS SHOWN FOR EACH CLASS DEVELOPED
FROM ETA KAPPA NU SALARY SURVEY OF 1930
Annual Salary in Dollars
Years after Graduation
Class of
Years after Graduation
1920 1500 2000 2770 4250
1921 1450 1900 2830 4000
1922 1250 1870 2850 3720
1923 1250 1820 2870 3450
1924 1300 1820 2900 3110
1925 1300 1870 2900
1926 1250 1990 2620
1927 1300 2060 2350
1928 1300 2070
1929 1540 1800

FIG. 3

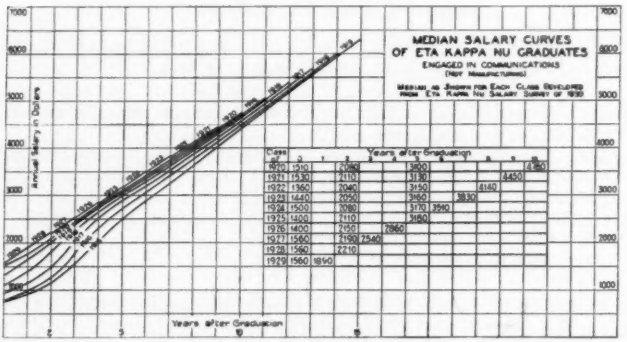

MEDIAN SALARY CURVES
OF ETA KAPPA NU GRADUATES
ENGAGED IN COMMUNICATIONS
(NOT MANUFACTURING)
MEDIAN AS SHOWN FOR EACH CLASS DEVELOPED
FROM ETA KAPPA NU SALARY SURVEY OF 1930
Annual Salary in Dollars
Years after Graduation
Class of
Years after Graduation
1920 1510 2080 3600 4350
1921 1530 2110 3130 4450
1922 1360 2040 3150 4140
1923 1440 2050 3160 3830
1924 1500 2080 3170 3540
1925 1400 2110 3180
1926 1400 2150 2860
1927 1560 2190 2540
1928 1560 2210
1929 1560 1890

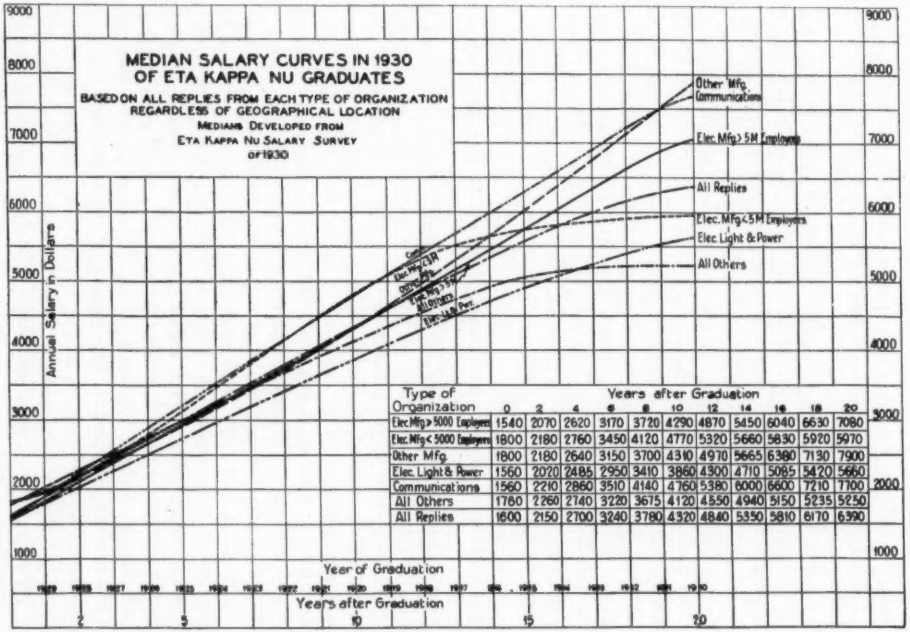
FIG. 4

for these classes are shown in the tabulation accompanying each set of curves.

A comparison of the 1930 salaries reported by men in the different organizations is afforded in Fig. 5. Be sure to note that each curve is made up by plotting the median salary in 1930 of each class, and therefore is not a progress curve of an individual class such as has been given in Figs. 2, 3 and 4. Each curve is a picture of the 1930 salary situation of the men included in the survey.

For the first ten years after graduation, several of the groups remain very close to each other. To assist in untangling the closely grouped curves, a table is given, showing the median salary for each group at two year intervals.

In general, Fig. 5 indicates that for the 1917 to 1926 graduates, the small electrical manufacturing group and the communications



Type of Organization	Years after Graduation 0	2	4	6	8	10	12	14	16	18	20
Elec. Mfg. > 5000 Employees	1540	2070	2620	3170	3720	4290	4870	5450	6040	6630	7080
Elec. Mfg. < 5000 Employees	1800	2180	2760	3450	4120	4770	5320	5660	5830	5920	5970
Other Mfg.	1800	2180	2640	3150	3700	4310	4970	5665	6380	7130	7900
Elec. Light & Power	1560	2070	2485	2950	3410	3860	4300	4710	5085	5420	5660
Communications	1560	2210	2860	3510	4140	4760	5380	6000	6600	7210	7100
All Others	1760	2260	2740	3220	3675	4120	4550	4940	5150	5235	5250
All Replies	1600	2150	2700	3240	3780	4320	4840	5350	5810	6170	6390

FIG. 5

group were leading in salary in 1930. For men in classes graduated earlier than 1917, the communications group was leading all other groups except in the case of the classes of 1910 and 1911. The small electrical manufacturing curve, however, flattens out for the classes of 1910 to 1916 so that the 1930 median salaries of the 1910 men in this group are lower than those of the 1910 men in Other Manufacturing, Communications and Large Electrical Manufacturing.

The curve of Other Manufacturing follows very closely and is slightly above that of Large Electrical Manufacturing, with the slight spread between men of more recent classes widening into an appreciable difference for the men graduated twenty years ago. At this point, the median salary of men in Other Manufacturing exceeds the median of every other group.

Except for the initial salary of the class of 1929, the median salaries reported by men in the electric light and power industry are the lowest of all groups except All Others. This latter curve, showing median salaries for the All Others group, flattens out at about sixteen years after graduation and is the lowest curve at the twenty year point.

Percentages Above and Below Median of All Replies

The replies from the five largest industries and from all the smaller groups have also been analyzed to show the percentage of replies in each type of organization above the median curve of all replies and the percentage below this median curve. The results are shown in Fig. 6.

This analysis was conducted in the following manner. For each group, the replies from each college class were separated into (1) those showing 1930 salaries above the median salary of all replies from that class and (2) those showing 1930 salaries below that median. For the classes of 1910 to 1919 inclusive, the replies in (1) were combined to give a total (A), the replies in (2) were combined to give a total (B), and (A) and (B) were then expressed as percentages $A + B$ amounting to 100 per cent. The same method was then applied to the classes of 1920 to 1929 inclusive. These percentages of replies above the median curves and of replies below it are shown graphically in Figure 6, two bars being shown for each type of organization. The first bar (cross-hatched) represents the percentages for the combined classes of 1910 to 1919 inclusive and the second bar (solid) represents the classes of 1920 to 1929 inclusive.

In many of the types of organizations the percentages for the earlier and the later classes are very nearly the same. However, in

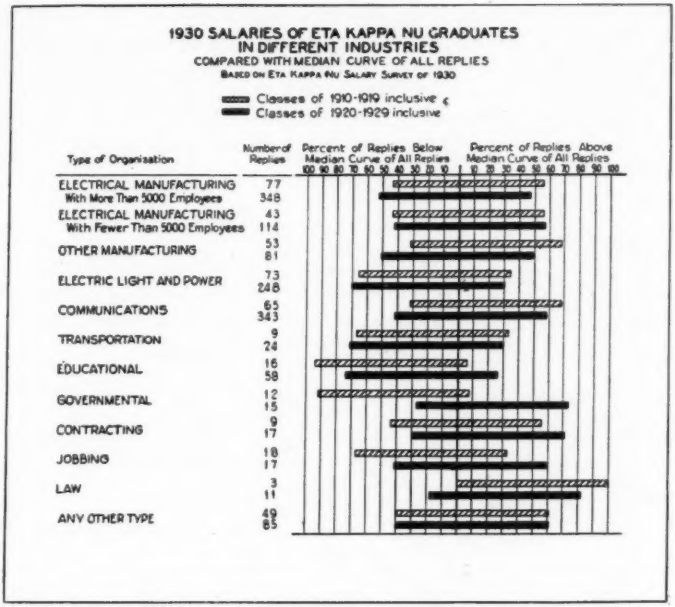

1930 SALARIES OF ETA KAPPA NU GRADUATES
IN DIFFERENT INDUSTRIES
COMPARED WITH MEDIAN CURVE OF ALL REPLIES
BASED ON ETA KAPPA NU SALARY SURVEY OF 1930
Classes of 1910-1919 inclusive
Classes of 1920-1929 inclusive
Type of Organization
Number of Replies
Percent of Replies Below Median Curve of All Replies
Percent of Replies Above Median Curve of All Replies
ELECTRICAL MANUFACTURING With More Than 5000 Employees 77 348
ELECTRICAL MANUFACTURING With Fewer Than 5000 Employees 43 114
OTHER MANUFACTURING 53 81
ELECTRIC LIGHT AND POWER 73 248
COMMUNICATIONS 65 343
TRANSPORTATION 9 24
EDUCATIONAL 16 58
GOVERNMENTAL 12 15
CONTRACTING 9 17
JOBBING 10 17
LAW 3 11
ANY OTHER TYPE 49 85

FIG. 6

governmental work, 73 per cent of the more recent graduates are above the median curve of all replies; of the earlier classes, only 8 per cent are above while 92 percent are below. In educational organizations, in the classes of 1920 to 1929, 26 per cent of the replies are above the median curve, while for the classes of 1910 to 1919, only 6 per cent are above the curve.

Although all the replies from men in the classes of 1910 to 1919 now engaged in legal work, probably patent law, are above the general median, the small number of replies in this classification should be remembered. The fact that 82 per cent of the men in the later classes are above the median curve seems more significant.

MEDIAN OF UPPER HALF AND OF LOWER HALF SHOWN FOR MANUFACTURING GROUPS

Figure 7 presents a median curve of the upper half and the median curve of the lower half of the replies from each of the three types of organizations constituting the manufacturing group, namely, Electrical Manufacturing with more than 5,000 employees, Electrical Manufacturing with fewer than 5,000 employees and

Other Manufacturing. Fig. 8 shows similar curves for the Electric Light and Power group and for the Communications group. These curves are all based on the 1930 salaries of the classes of 1910 to 1929. They are not progress curves of any individual class.

It should be remembered that in the compilation of the data for Figs. 6, 7 and 8 no account was taken of the geographical distribution.

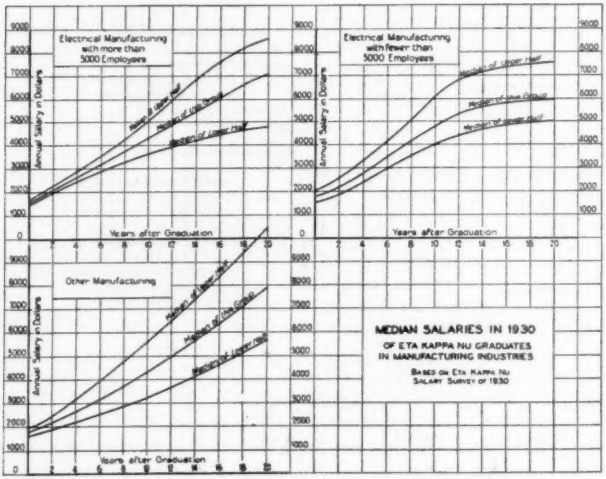

Electrical Manufacturing with more than 5000 Employees
Electrical Manufacturing with Fewer than 5000 Employees
Other Manufacturing
Annual Salary in Dollars
Years after Graduation
Median of Upper Half
Median of Whole Group
Median of Lower Half
MEDIAN SALARIES IN 1930
OF ETA KAPPA NU GRADUATES
IN MANUFACTURING INDUSTRIES
Based on Eta Kappa Nu Salary Survey of 1930

FIG. 7

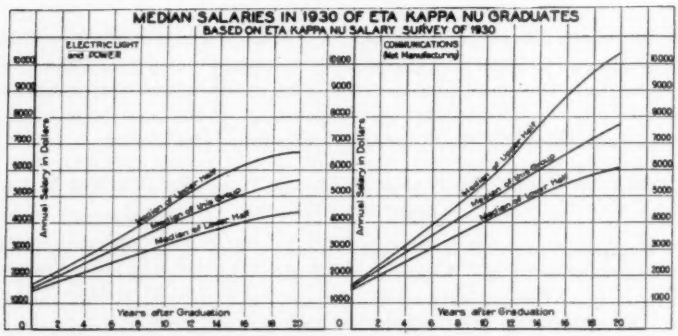

MEDIAN SALARIES IN 1930 OF ETA KAPPA NU GRADUATES
BASED ON ETA KAPPA NU SALARY SURVEY OF 1930
ELECTRIC LIGHT and POWER
COMMUNICATIONS (Not Manufacturing)
Annual Salary in Dollars
Years after Graduation
Median of Upper Half
Median of Whole Group
Median of Lower Half

FIG. 8

Returns Analyzed by Departments

The instructions accompanying each survey card listed seven types of departments or positions; namely: engineering and design; manufacturing and production; sales; research; consulting; teaching, and all others. In Fig. 9 are shown median curves of departmental salaries for those industries and departments which supplied sufficient data for such curves.

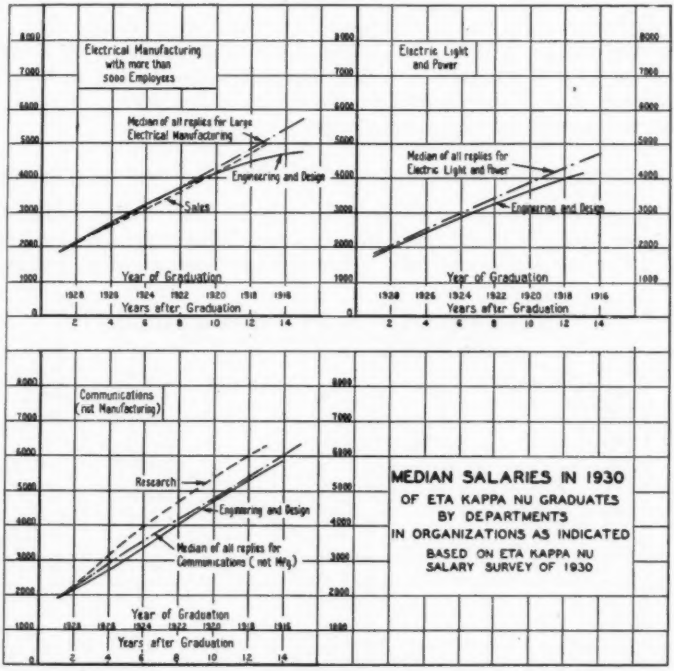

Electrical Manufacturing with more than 5000 Employees
Median of all replies for Large Electrical Manufacturing
Engineering and Design
Sales
Year of Graduation
1928 1926 1924 1922 1920 1918 1916
Years after Graduation
2 4 6 8 10 12 14
Electric Light and Power
Median of all replies for Electric Light and Power
Engineering and Design
Year of Graduation
1928 1926 1924 1922 1920 1918 1916
Years after Graduation
2 4 6 8 10 12 14
Communications (not Manufacturing)
Research
Engineering and Design
Median of all replies for Communications (not Mfg.)
Year of Graduation
1928 1926 1924 1922 1920 1918 1916
Years after Graduation
2 4 6 8 10 12 14
MEDIAN SALARIES IN 1930
OF ETA KAPPA NU GRADUATES
BY DEPARTMENTS
IN ORGANIZATIONS AS INDICATED
BASED ON ETA KAPPA NU
SALARY SURVEY OF 1930

Fig. 9

Comparison of these curves indicates that in Large Electrical Manufacturing, sales work pays slightly less than engineering and design for the classes of 1920 to 1929, while for the earlier classes the median salary in sales exceeds that in engineering and design. In Electric Light and Power, the engineering and design median salary is below the median for that industry. In Communications, the median salary of research men is consistently above that of the men in engineering and design. About 55 per cent of the total

number of men who replied in each of these industries were in engineering and design. In Communications, 17 per cent were in research while in Large Electrical Manufacturing 20 per cent were in sales.

A further analysis of the salaries for these three types of organization, showing the percentage of men in each department who are above the median curve of all replies for the given type of organization, substantiates these curves. In these organizations, research is most consistently shown to have its men above the medians for their own industries. In general, over 70 per cent of the men in this type of activity are above those medians. This advantage of the research men may be partly due to the fact that they are often concentrated in the larger cities which are headquarters points for their organizations.

Effect of Geographical Location and Size of Cities on Salaries

Comparison between the median salaries reported in different sections and also in different sizes of cities is made possible by Fig. 10. The median salary curves for the four geographical sections

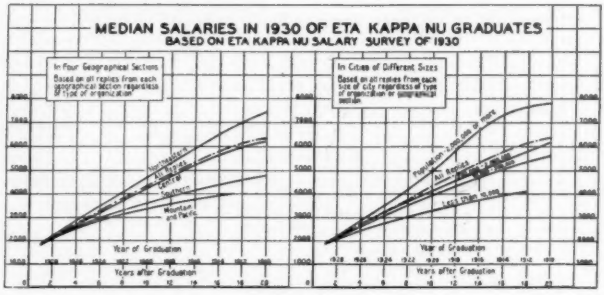

MEDIAN SALARIES IN 1930 OF ETA KAPPA NU GRADUATES
BASED ON ETA KAPPA NU SALARY SURVEY OF 1930
In Four Geographical Sections
Based on all replies from each geographical section regardless of type of organization
In Cities of Different Sizes
Based on all replies from each size of city regardless of type of organization or geographical section
Northeastern
All Sections
Central
Southern
Mountain and Pacific
Foreign
Population 1 million or more
All Sizes
Year of Graduation
Years after Graduation

Fig. 10

and for cities of different sizes have been prepared from all replies regardless of type of organization. These geographical sections are shown in Fig. 11.

The results indicate that salaries by geographical sections may be ranked (from highest to lowest) in the order: Northeastern, Central, Southern, Mountain and Pacific. Every section was fairly well represented, the percentages of members in each section who sent in replies being as follows: Northeastern, 66; Central, 43; Southern, 41; Mountain and Pacific, 49; Foreign, 34.

The analysis by size of city indicates a direct relation between the size of city and the size of salary, with a wide spread in salary between the villages and the very large cities. The fact that head-

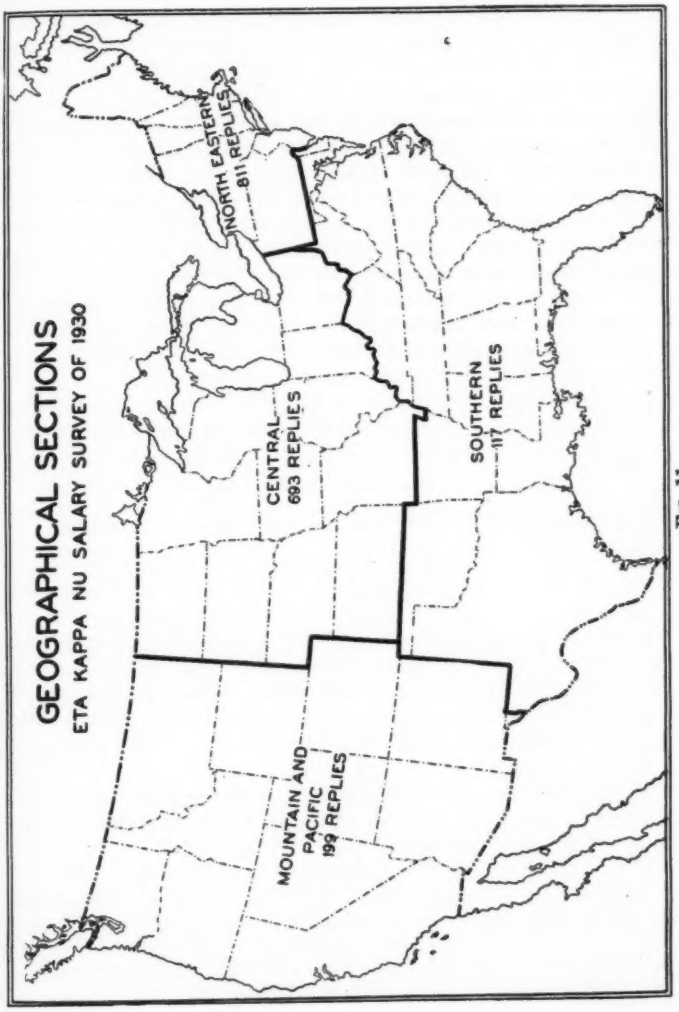

GEOGRAPHICAL SECTIONS
ETA KAPPA NU SALARY SURVEY OF 1930
NORTH EASTERN
811 REPLIES
CENTRAL
693 REPLIES
SOUTHERN
117 REPLIES
MOUNTAIN AND
PACIFIC
199 REPLIES

FIG. 11

quarters offices of large organizations are usually located in the larger cities is probably a contributing factor to the higher medians of the cities.

Table III shows what percentages of the total number of replies from the United States came from each section and from each size of city. The very few replies from foreign countries and United States territorial possessions were not considered.

The salary differences between various industries (as shown in Fig. 5) may have been influenced substantially by geographical and city distribution. Analysis of the returns of each of the three largest groups (Large Electrical Manufacturing, Communications and Electric Light and Power) on the basis of the per cent employed in 1930 in each geographical section shows that the heavy concentration of communications and large electrical manufacturing men appears in the Northeastern area, while the majority of the electric light and power men are reported in the Central area. The following table gives the geographical distribution:

TABLE I

Section	Large Elec. Mfg.	Communications	Electric Lt. & Pwr.
Northeastern	69.3%	57.3%	24.1%
Central	21.8	26.0	51.6
Southern	3.5	4.6	8.2
Mountain and Pacific	4.5	11.6	15.2
Foreign	0.9	0.5	0.9
	100.0	100.0	100.0

It is to be remembered, of course, that the distribution in 1925 or in any other year preceding 1930 was probably somewhat different. Also, the distribution of graduates of the earlier classes is not the same as the distribution of the later classes. However, the figures given above are fairly representative for both the earlier and the later classes.

Analysis of the same three largest groups on the basis of the percentage employed in 1930 in cities of various sizes provides the following table of distribution:

TABLE II

* Cities with Population of	Large Elec. Mfg.	Communications	Electric Lt. & Pwr.
2,000,000 and over	18.9%	52%	28.3%
500,000–2,000,000	34.3	21.6	18.0
10,000–500,000	45.7	24.2	46.7
Less than 10,000	1.1	2.2	7.0

* Based on 1920 census figures. Refers to city of business location rather than to city of residence.

The heavy concentration of large electric manufacturing and electric light and power men appears in medium-size cities of 10,000 to 500,000 population; of communications men in the large cities of 2,000,000 and over.

What Effect Has Graduate Study?

In the five largest groups of replies; namely, Large Electrical Manufacturing, Small Electrical Manufacturing, Other Manufacturing, Electric Light and Power, and Communications (not manufacturing), 331 men or 22.3 per cent of those who were graduated in the classes of 1910 to 1929 inclusive later carried on graduate work. When each of these men was compared on a salary basis with the median salary curve for all of the men in his type of organization, it was found that 56.8 per cent were above the median salary curves of their respective types of organization.

An analysis of the salaries of the men who have changed from one industry to another after the first five years out of college and those who have continued with the same type of organization after this period showed no significant difference. However, the small number of replies available for this part of the survey minimized the importance of any indication that a change in type of employment would have little effect.

Reduction to Money of Constant Purchasing Power

All of the data which have been presented in this survey have been expressed in terms of dollars but not in terms of effective purchasing power. Prices of the year 1913 are often taken as a base for reference. If the cost of living, say in 1918, had increased over the cost in 1913 by 60 per cent, while the 1918 salary had been increased over the 1913 salary by 20 per cent, the net result would have been an effective purchasing power in 1918 of only 120/160, or 75 per cent, as compared to 100 per cent purchasing power in 1913.

The "cost of living" index, prepared by the U. S. Bureau of Labor Statistics with 1913 as a standard year, applies to wage earning families with annual incomes less than most of the salaries included in this survey. Many investigators have revised the index and some have attempted to compute an index for persons with higher salaries. However, the original index has been used in the preparation of Fig. 12, with full knowledge that the results must be considered very approximate. Probably the men in the higher salary ranges in this survey were subjected to a smaller percentage reduction in the effective purchasing power of each of their dollars than were the wage earners for whom this index was prepared, but even with that correction the effective purchasing power of the

higher salaried men has been well removed from 100 per cent for several years. The curves in Fig. 12 apply only to the class of 1910. If it is desired to prepare a similar curve for some other class, Table IV will be of assistance. The approximate purchasing power in 1913 dollars of any given salary is obtained for each date by dividing that salary by the "cost of living" index figure for that date.

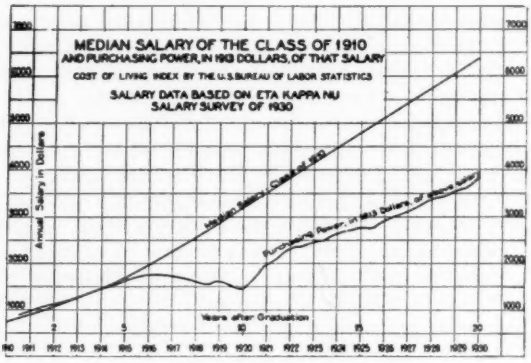

MEDIAN SALARY OF THE CLASS OF 1910
AND PURCHASING POWER, IN 1913 DOLLARS, OF THAT SALARY
COST OF LIVING INDEX BY THE U.S. BUREAU OF LABOR STATISTICS
SALARY DATA BASED ON ETA KAPPA NU
SALARY SURVEY OF 1930
Annual Salary in Dollars
Years after Graduation

FIG. 12

TABLE III

DISTRIBUTION OF REPLIES BY GEOGRAPHICAL SECTION AND SIZE OF CITY

(Based on 1920 Census Figures)

Geographical Section *	Number of Replies	Per Cent of Total Replies
Northeastern	811	45
Central	693	38
Southern	117	6
Mountain and Pacific	199	11
	1820 **	

Size of City--Population	Number of Replies	Per Cent of Total Replies
Less than 10,000	95	5
10,000 to 500,000	702	38
500,000 to 2,000,000	485	27
2,000,000 or more	553	30
	1835 **	

* Foreign replies omitted.

** A few replies did not specify geographical section; others did not specify size of city.

TABLE IV

Trend of the Cost of Living

(Index Numbers, with 1913 as 100)

1910 Dec.	93	1923 March	169
1911 Dec.	92	1923 June	170
1912 Dec.	98	1923 Sept.	172
1913 Dec.	100	1923 Dec.	173
1914 Dec.	103	1924 March	170
1915 Dec.	105	1924 June	169
1916 Dec.	118	1924 Sept.	171
1917 Dec.	142	1924 Dec.	172.5
1918 Dec.	174	1925 June	173.5
1919 June	177	1925 Dec.	177.9
1919 Dec.	199	1926 June	174.8
1920 June	217	1926 Dec.	175.6
1920 Dec.	200	1927 June	173.4
1921 May	180	1927 Dec.	172.0
1921 Sept.	177	1928 June	170.0
1921 Dec.	174	1928 Dec.	171.3
1922 March	167	1929 June	170.2
1922 June	166	1929 Dec.	171.4
1922 Sept.	166	1930 June	166.6
1922 Dec.	170	1930 Dec.	160.7

THE 1932 SESSIONS OF THE SUMMER SCHOOL FOR ENGINEERING TEACHERS

By H. P. HAMMOND

Preparations for the two sessions of the Society's Summer School that are to be held during July are practically completed. As previously announced, the session on economics, President Harvey N. Davis, Director, will be held at Stevens Institute of Technology from July 5 to July 21, inclusive. The session on English, Miss Sada A. Harbarger, Director, will be held at The Ohio State University from July 11 to 28, inclusive. Exceptionally excellent programs and strong staffs have been arranged for both of the sessions.

The program of the session on economics will have three principal divisions: (1) discussion of the organization, content and teaching of courses in economics and economics of engineering; (2) organization and methods of courses auxiliary to economics; (3) a short course in the principles of general economics. The following excerpt from the program gives some idea about its general nature:

TUESDAY, JULY 5

9:00 A.M.	12 Noon Registration
1:30 P.M.	Opening of the Session, President Harvey N. Davis, presiding
	Address of Welcome ..... Harvey N. Davis
	Response ..... H. P. Hammond
	Economics in Engineering Education—I ..... W. D. Ennis
7:30 P.M.	Smoker

WEDNESDAY, JULY 6

9:00 A.M.	The Present Status of Economics and Related Courses in Engineering Curricula .... G. W. Barnwell
10:30 A.M.	Economics in Engineering Education—II ..... W. D. Ennis
1:30 P.M.	Characteristics of the American Economic System ..... John M. Clark

THURSDAY, JULY 7

9:00 A.M.	A Course in General Economics for Engineering Students ..... S. S. Garrett
10:30 A.M.	Elementary Principles of Money and Credit ..... John M. Clark
1:30 P.M.	Methods of Teaching the General Course in Economics ..... S. S. Garrett

FRIDAY, JULY 8

9:00 A.M.	A Course in Accounting for Engineering Students ..... J. R. Bangs, Jr.

10:30 A.M. Methods of Teaching Economics of Engineering ....E. L. Grant
1:30 P.M. Prices: Competitive Conditions, Monopoly Conditions .....Irving Fisher

SATURDAY, JULY 9

9:00 A.M. Business Cycles .....(Speaker to be announced)
10:30 A.M. Public Utility Valuation and Rate Making .....W. D. Ennis

MONDAY, JULY 11

9:00 A.M. Courses in Corporation Management and Finance .....C. W. Gerstenberg
10:30 A.M. Teaching Specific Problems of Economics of Engineering: Depreciation and Obsolescence, Capitalized Costs .....E. L. Grant
1:30 P.M. International Trade .....G. B. Roorbach

TUESDAY, JULY 12

9:00 A.M. Curricula in Industrial Engineering .....J. W. Roe
10:30 A.M. Economic Characteristics of the Manufacturing Industries .....Walter Rautenstrauch
1:30 P.M. Forecasting .....K. W. Jappe
7:30 P.M. Taylor and Gantt: Their Contribution to Modern Industry .....Conrad Lauer and L. P. Alford

WEDNESDAY, JULY 13

9:00 A.M. Industrial Economics .....D. S. Kimball
10:30 A.M. Teaching Specific Problems of Economics of Engineering; Load Factor, Economics of Capacity, Diversity Factor .....W. A. Shoudy
P.M. Trip to Stevens Institute Surveying Camp

The program of the session on English is also divided into three principal parts: (1) discussion of the general principles of teaching; (2) study of the organization, content and methods of teaching English to engineering students; (3) lectures by prominent industrial leaders and engineers on the use of English in practical engineering work. The following excerpt from the program gives some idea about its general nature and content:

MONDAY, JULY 11

8:30 A.M. Registration
1:30 P.M. Opening of the Session, Sada A. Harbarger, presiding
Addresses of Welcome .....{President G. W. Rightmire / Dean E. A. Hitchcock}
Response .....H. P. Hammond
English in Engineering Education .....Ray Palmer Baker
The Learning Process .....Earl B. Taylor
7:30 P.M. Smoker

TUESDAY, JULY 12

8:30 A.M. Principles of Teaching .....Earl B. Taylor
10:00 A.M. Curriculum Provisions for English in Engineering Colleges .....H. L. Creek
1:30 P.M. Problems of Administering English Work in Engineering Colleges .....Ray Palmer Baker

WEDNESDAY, JULY 13

8:30 A.M. The Function of the Teacher .....Earl B. Taylor
10:00 A.M. Content of a Course in Composition for Engineering Students .....Sada A. Harbarger

THURSDAY, JULY 14

8:30 A.M. Dealing with the Student as an Individual .....Earl B. Taylor
10:00 A.M. Principles Governing the Plan of the Writing ...A. T. Robinson
1:30 P.M. The Ideal Curriculum in English for Engineering Students, a Symposium

FRIDAY, JULY 15

8:30 A.M. Development of the Idea in Compositions .....A. T. Robinson
10:00 A.M. Teaching Literature in Engineering Colleges .....S. M. Tucker
1:30 P.M. Comprehensive Courses in Literature .....Edwin Mims

SATURDAY, JULY 16

8:30 A.M. How English Teaching Looks to the Engineering Dean .....A. A. Potter
10:00 A.M. Combined Courses in the Humanities for Engineers H. G. Pearson

The staffs of the two sessions of the School are given in full below:

STAFF OF THE SESSION ON ECONOMICS

Local Director of the Session: Harvey N. Davis, President, Stevens Institute of Technology.

Secretary: James Creese, Vice-President, Stevens Institute of Technology.

Chairman of the Teaching Staff: William D. Ennis, Alexander Crombie Humphreys Professor of Economics of Engineering, Stevens Institute of Technology.

L. P. Alford, Vice-President, The Ronald Press Company.

John R. Bangs, Jr., Professor of Administrative Engineering, Cornell University.

George W. Barnwell, Assistant Professor in Economics of Engineering, Stevens Institute of Technology.

R. W. Burgess, Chief Statistician, Western Electric Company.

John M. Clark, Professor of Economics, Columbia University.

W. B. Donham, Dean, Graduate School of Business Administration, Harvard University.
Fred R. Fairchild, Professor of Political Economy, Yale University.
Irving Fisher, Professor of Political Economy, Yale University.
Ralph E. Flanders, Manager, Jones and Lamson Machine Company.
Seymour S. Garrett, Professor of Industrial Economics, Cornell University.
Charles W. Gerstenberg, Chairman of the Board, Prentice-Hall, Inc.
Eugene L. Grant, Associate Professor of Civil Engineering, Stanford University.
Arthur M. Greene, Jr., Dean, School of Engineering; Professor of Mechanical Engineering, Princeton University.
Lewis H. Haney, Director, Bureau of Business Research, New York University.
Joshua E. Hannum, Director, Engineering Index Service, American Society of Mechanical Engineers.
William F. Hosford, Vice-President in Charge of Manufacture, Western Electric Company.
E. W. James, Chief, Division of Highway Transport, Bureau of Public Roads.
K. W. Jappe, President, The Brookmire Economic Service.
Dexter S. Kimball, Dean, College of Engineering; Professor of Industrial Engineering, Cornell University.
Conrad N. Lauer, President, American Society of Mechanical Engineers; President, Philadelphia Gas Works.
George Orrok, Consulting Engineer.
W. N. Polakov, Consulting Engineer.
Walter Rautenstrauch, Professor of Industrial Engineering, Columbia University.
William Z. Ripley, Professor of Political Economy, Harvard University.
Joseph W. Roe, Professor of Industrial Engineering, New York University.
George B. Roorbach, Professor of Foreign Trade, Harvard University.
D. H. Sawyer, Director, Federal Employment Stabilization Board.
Erwin H. Schell, Professor of Business Management, Massachusetts Institute of Technology.
William A. Shoudy, Associate Professor of Mechanical Engineering, Columbia University.
Flavel Shurtleff, Secretary, National Conference on City Planning.
A. Wellington Taylor, Dean, Graduate School of Business Administration, New York University.
Colston E. Warne, Associate Professor of Economics, Amherst College.

Staff of the Session on English

Local Director of the Session: Sada A. Harbarger, Assistant Professor of English, The Ohio State University; Chairman, Committee on English, S. P. E. E.

Secretary: Wilson R. Dumble, Instructor in English, The Ohio State University.

Ray Palmer Baker, Professor of English, Assistant Director, Rensselaer Polytechnic Institute.

W. Otto Birk, Professor of English in Engineering, University of Colorado.

H. L. Creek, Professor of English, Purdue University.

A. C. Howell, Associate Professor of English, University of North Carolina.

Victor A. Ketcham, Professor of English, The Ohio State University.

H. S. Leach, Librarian, Lehigh University.

John Mills, Director of Publication, Bell Telephone Laboratories.

Edwin Mims, Professor of English, Vanderbilt University.

J. R. Nelson, Professor of English, University of Michigan.

C. W. Park, Professor of English, University of Cincinnati.

James W. Parker, Chief Engineer, Detroit Edison Company.

H. G. Pearson, Professor of English, Massachusetts Institute of Technology.

A. A. Potter, Dean, Schools of Engineering, Purdue University.

Robert I. Rees, Assistant Vice-President, American Telephone and Telegraph Company.

A. T. Robinson, Professor of English, Massachusetts Institute of Technology.

Charles F. Scott, Professor of Electrical Engineering, Yale University; Chairman, Board of Investigation and Coördination, S. P. E. E.

G. A. Stetson, Editor, American Society of Mechanical Engineers.

Earl B. Taylor, Professor of Education, University of Rochester.

S. M. Tucker, Professor of English, Polytechnic Institute of Brooklyn.

William D. Turnbull, Junior Dean, College of Engineering, The Ohio State University.

Raymond Walters, Dean, Swarthmore College; President-elect University of Cincinnati.

Roy V. Wright, Managing Editor, Railway Age.

Both Stevens Institute, where the Economics session will be held, and the Ohio State University, the site of the English session, provide excellent facilities for the Summer Schools. At Stevens Insti-

tute the members of the group will be housed in Castle Stevens, which occupies a magnificent site overlooking the Hudson River, with the skyline of New York City in the background, and the shipping of the harbor in the foreground. At Columbus the members will be housed in Neil Hall, a modern dormitory of the University.

At both of the sessions there will be ample provision for recreation and sports.

The cost of room and meals at Stevens Institute will be $50 for the period of the session. At Columbus the charge will be $42. A registration fee of $10 will be charged those in attendance.

The sessions of 1932 are the first to be devoted to what are commonly known as the cultural divisions of the curriculum. It is evident, however, from the number of reservations received, that the attendance will be equal to that of former years.

Those wishing to attend either session of the school should submit a letter of application giving the name, academic title and institution of the applicant. The letter should be addressed to Director H. P. Hammond, S. P. E. E., 99 Livingston Street, Brooklyn, N. Y.

PERSONNEL METHODS IN USE IN ENGINEERING SCHOOLS *

REPORT OF THE SPECIAL COMMMITTEE OF THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION FOR 1930–31. COMMITTEE: G. W. HOLCOMB; C. V. MANN; A. D. MOORE; H. S. ROGERS, *Chairman;* J. E. WALTERS

Introduction

Developments in Personnel Services.—The developments and progress made in personnel services have been rapid in recent years. There has not, however, been any survey of those methods, procedures, and practices which are proving satisfactory in the judgment of engineering administrators. A discussion of personnel methods in the council meetings at Montreal in 1930, therefore, brought about the appointment by President H. S. Boardman of a special committee on Personnel Methods in Use in Engineering Schools. During the past academic year the committee has sent a questionnaire to all the institutional members of the S. P. E. E. and has collated and analyzed the answers from the institutions in this report. In addition to gathering these facts the committee has made a study and evaluation of the philosophy of personnel service and an analysis of the practices and procedures at present utilized.

Many other forms of student welfare work have been developed collaterally with personnel systems in response to experienced needs in our colleges. Such services cover a wide range of specific needs immediately evident in the mention of the health service, the psychological clinic, the student loan fund, the student employment office, the office of the dean of men and fraternity advisors. Other administrative functions such as those some times exercised by scholarship and student discipline committees are closely allied to personnel work. Some institutions have so coördinated the personnel service that it does or will supplant many of these general welfare agencies. The primary purposes of a personnel service as at present quite generally conceived are, however, specifically directed toward intimate and personal influence and counsel for the purpose of bringing out of each student the highest development possible.

Many personnel services extend both into preregistration and graduation areas. The committee has, however, limited its study

* Presented at the 39th annual meeting, S. P. E. E., Purdue University, June 17–19, 1931.

to those personnel services extended to students between the period of registration and graduation. The survey of personnel practices discloses a wide variety of procedures and many forms of administration. It indicates, however, that the majority of schools are working toward the fulfillment of some rather definite and common needs and that they are beginning clearly to recognize and outline these needs and to develop and adjust the services necessary to meet them. The committee hopes that the report upon present services and procedures, the discussion of the philosophy and the analysis of the personnel methods presented in this report will contribute something to the development and improvement of personnel services.

Survey of Personnel Procedures and Services

The data relating to personnel methods in use in engineering schools presented herein were obtained by a questionnaire circulated to fifty-eight schools that are institutional members of the S. P. E. E. The questionnaire (see appended copy) was mailed directly to the S. P. E. E. representative of each institution. Forty-six, or seventy-eight per cent of the number sent out, were returned properly scored. The engineering enrollment of the schools included in the list reporting varied between 185 and 3,209 students.

In preparing a questionnaire to obtain a picture of the personnel methods in use in engineering schools, personnel work was divided into seven major divisions; namely, administration, individual studies and records, educational information and counsel, vocational information and counsel, personality development and habit discipline, placement, and special methods and comments. Under these divisions it was possible to obtain a fairly accurate picture of the organizations, objectives, and methods employed in the engineering schools.

The classification of data presented difficult problems of comparison by means of the customary graphs. Many schools make use of two or more methods to accomplish the same end, and since there were numerous combinations of these methods in use, it was necessary to confine the tabulations to the form of tables with explanatory notes. In some cases, in order to illustrate the organization in schools using combination methods, tables are built to read both horizontally and vertically. All tables and percentages except those of Table I are based upon the replys from forty-six schools.

Organization and Administration.—The organization of personnel work in engineering schools may be classified in three types: (1) as a subordinate unit of a general institutional system, (2) as a coördinate unit with other divisional units, and (3) as an inde-

pendent system. The replies to the survey show that sixty-one per cent of the schools have an organized system of personnel, twenty-nine per cent do personnel work in an unorganized way, and ten per cent do no work of a personnel nature.

Fifty-four per cent of the schools that are organized, operate an independent system controlled by men in the engineering school. In this group six are directed by the dean or junior dean, five by a personnel officer, one by a faculty committee, and two by a committee of department heads. Nineteen per cent are organized as subordinate units of a general institutional system, of which one is directed by a personnel officer, two by department heads working with the personnel officer, two by the dean in coöperation with the personnel officer, and one by a faculty committee. Twenty-seven per cent are organized as a unit coördinate with other units of an institutional system, but operate practically as independent units. One of these is directed by an engineering school personnel officer, one by a faculty committee, three by the dean of engineering, and two by a committee of department heads. Eight per cent of the schools reported that an organized system did not indicate the kind of organization they were using. Table I presents the data upon the organization of personnel service in the twenty-six schools which reported organizations.

TABLE I

ORGANIZATION AND ADMINISTRATION REPORTED BY 26 SCHOOLS

Personnel Service / Organization	Directed by: Personnel Officer	Faculty Committee	Department Heads	Dean or Junior Dean	Totals and Per cent of Schools
Organized as an independent system	5	1	2	6	14—54%
Organized as a subordinate unit of a general institutional system	1	1	1	2	5—19%
Organized as a coördinate unit with other divisional units of an institutional system	1	1	2	3	7—27%
Totals and per cent of Schools	7 27%	3 12%	5 19%	11 42%	26 100%

Number of Schools reporting: No organization 15
Number of Schools reporting: No organization but doing personnel work 3
Number of Schools reporting: Organization but kind of organization not given in questionnaire 2

Several of the schools that do not have an organized personnel service at present maintain an informal service for the guidance and help of students. The Armour Institute of Technology, 870 students, states, "the deans, and at least one faculty member in each department are in exceptionally close contact with the student body, and with a minimum of routine and formality, help to solve problems of adjustment and personal difficulties." Tulane University, 329 students, says in part, "The Dean of the College conducts a course in Engineering Problems, required of all freshmen in the College. By means of this class he is enabled to get into intimate touch with a new student in a way, which to him at least, seems more effective than some of the more highly organized systems. This, of course, would not be possible were the freshman class very much larger than it is at present, namely, about 160 men."

Counsellors.—The guidance of students in engineering is considered important by most schools because eighty-nine per cent of the schools replying to the questionnaire have assigned advisers for their engineering students. This is a considerably higher percentage than the number that have an organized engineering personnel system and indicates that there are several schools that carry on a more or less unorganized personnel service in recognition of an obligation to give students advice about their courses and work whenever it is requested. Some of these schools that reported no organization have apparently a fairly well organized advisory system, which is generally considered a part of the personnel system, so that perhaps more than sixty-one per cent of the schools are fairly well organized for some phase of personnel work.

The advisers of engineering students are generally instructors who are in contact with the students in classes. Sixty-five per cent of the schools have advisers (Table II), who are in this group, thirty-nine per cent are administrators in engineering departments, nine per cent are members of the engineering school personnel office, nine per cent are members of a central personnel office.

These data indicate that engineering school administrators believe the best adviser is the man who is in closest contact with the student. The heads of departments like drawing, freshmen engineering, general engineering, and physics, are in contact with the students practically as much as the instructors in the classes. These two comprise eighty-five per cent of all the advisers.

An organization of advisers, if it is to give sound counsel to all students, must have a well-defined system of supervision and coördination, which will bring each of the advisers to a common understanding of their problems. Several methods are in use in the schools for effecting this coördination. Sixty-three per cent of the schools accomplish it through the dean or junior dean, who

TABLE II

STUDENT COUNSELLORS

		Advisers Contacting Students				Totals and Per cent of Schools
		Members of Central Personnel Office	Members of Engr. School Personnel Office	Admin. in Engineering Departments	Engr. Instr. in Contact through Classes	
Supervisory and Coördinating Officer	Personnel Director	1	2	1	6	10—22%
	Dean or Junior Dean	1	2	9	17	29—63%
	Dept. Head, Head of Fresh. Engr.	1		5	4	10—22%
	None	1		3	3	7—15%
Total and per cent of Schools		4 9%	4 9%	18 39%	30 65%	*

41 schools have advisers.
17 of the above 41 use combined methods.
5 schools have no advisers.

* Does not equal 100 per cent because of combinations.

acts as an executive head of all advisers (Table II). Twenty-two per cent of the schools have a personnel director to coördinate the work. In twenty-two per cent the head of freshmen engineering and the heads of the major academic departments are the coördinators. No attempt at coördination is made in fifteen per cent of the schools.

Coördination of Counsellors.—Eighty per cent of the schools having assigned advisers provide means of bringing the advisers to a common understanding of their problems and methods of personal counseling. Forty-one per cent of these use committee conferences of advisers (Table III), forty-seven per cent use individual conferences of advisers with their supervisors, and twenty per cent issue special bulletins describing methods and procedures. Some of the schools use two or more of these methods in combination.

The replies of the survey show that when the responsibility of the work of advisers is held by the dean or junior dean, these administrators attempt to bring the advisers to a common understanding through individual instruction in fifty-four per cent of the cases (not shown in tables), and through committee conferences in thirty-one per cent. Special bulletins are used as a supplemen-

TABLE III

COÖRDINATION OF COUNSELLORS

Are any steps undertaken to bring advisers to common understanding of problems and methods of personal counseling?

	No.	Per cent
1. Through committee conference	19	41
2. Through special bulletins	9	20
3. Through individual direction	22	47

tary means to either of the above methods, but never as an independent method. When heads of departments are in charge of coördination, the advisers are brought to a common understanding either through committee conferences or by individual instruction. Personnel directors use all three methods of bringing about unity of thought.

Case Problems.—Difficult problem cases are referred to other departments for special treatment in fifty-two per cent of the schools. (Table IV.)

TABLE IV

PROBLEM CASES

Are problem cases in student adjustment referred to other departments?

	Number
(Yes)	24

To which departments do you refer problem cases?	Number
a. Psychological clinic	19
b. Health service	25
c. Scholarship committee	18
d. Other departments:	
1. Department heads	3
2. Dean of men	2

Nineteen schools refer problem cases to the psychological clinic, twenty-five to the health service, eighteen to the scholarship committee, two to the dean of men, and three to the department heads. The health service, psychological clinic, and the scholarship committee were all three named by practically all schools that sent their students out of the jurisdiction of the engineering school.

A number of institutions have a special kind of advisory system. The University of Michigan says, "The Mentor System is a comprehensive scheme by which a sincere effort is made to deal with the engineering freshman as an individual; the intention is to effect a happy adjustment in the freshman to college life, in as rapid and complete a way as possible." This is a well organized system of advisers for freshmen. After the first year, "the student is largely expected to stand alone. However, in many cases the

student continues relationships with his adviser." The students in another school consult with the registrar and the Dean, and "In the dormitories we have proctors (these are teachers) who are also advisers to the students." Tulane University states that, "While we do not have assigned faculty advisers, students are encouraged to bring their problems to the Dean and to individual professors, and our experience indicates that they do this quite freely. Cases of students whose problems are unusually serious are brought up at regular intervals before the whole faculty and thoroughly discussed." At Northeastern University each adviser is assigned thirty to forty freshmen. "Advisers keep regularly scheduled conference hours during which they endeavor to become adequately acquainted with each student's personality and circumstances. All freshmen receive their course grades from their advisers, a procedure which permits the timely discussion of scholastic problems and difficulties. . . . It is also a valuable kind of preventive work in that not infrequently the contact of the adviser with his freshmen results in the redirection of attention and energy from destructive and anti-social directions to constructive and socially approved ones."

Administration of Placement.—Of the schools that are organized for placement, eleven are organized under the heads of the major academic departments, four under the dean of engineering, thirteen under the dean of engineering in coöperation with the heads of the respective departments, four under officers independent of the personnel service such as appointment secretaries or specially assigned faculty members, four under the central personnel officer, and three under the central personnel officer in coöperation with the dean (Table V).

Twenty-eight of the schools, sixty-one per cent, have organized placement services entirely within the engineering schools under engineering administrators. Four schools leave the placement work entirely to the central personnel office. Seventy-six per cent of the placement work is, therefore, conducted under the supervision of some member of the staff of the engineering school, generally the dean or department heads.

Individual Studies and Records.—Records of various kinds are collected for personnel work in all engineering schools. Eighty per cent of the engineering schools have the student's credentials from the high school last attended (Table VI), sixty-three per cent obtain data regarding the student, such as the information regarding parentage, family history, previous activities and accomplishments, and other data which might be of value to personnel work. Fifty-nine per cent of the schools give some form of standard intelligence tests. Four schools indicated that they did not

TABLE V

ADMINISTRATION OF PLACEMENT

Do you have a placement service as a unit of the personnel system? Yes...22 No....23

Officers Responsible for Placement

	Heads of Major Department	Dean of Engineering	Officer Independent of Pers. Serv.	Central Personnel Officer
Central Personnel Officer...		3		4
Officer Independent of Personnel Services.....			4	Number of Schools,
Dean of Engineering.....	13	4		
Heads of Major Departments.....	11			

give any form of intelligence tests whatever. Forty-six per cent give mathematics placement examinations, fifty per cent English placement examinations, twenty-two per cent physics placement examinations, seven per cent drawing placement examinations, twenty-four per cent interest inventories, eleven per cent chemistry

TABLE VI

INDIVIDUAL STUDIES AND RECORDS

	Number	Per cent
1. Which of the following student records are collected in the institution for personnel work?		
a. High School credentials	37	80
b. Biographical data	29	63
c. Intelligence tests	27	59
d. Placement examinations:		
(1) Mathematics	21	46
(2) English	23	50
(3) Physics	10	22
(4) Drawing	3	7
e. Interest Inventory	11	24
f. Psychoneurotic Inventory	2	4
g. Other tests or Inventories:		
(1) College Board Examination	1	2
(2) Chemistry	5	11
(3) Reading	1	2
h. Health Service Report	18	40
i. Personality rating	15	32
j. General data on vocational and educational plans	20	43
2. Are all records of each student accumulated in one folder? (Yes)	22	48
3. Are these records used by student counselors? (Yes)	33	71

examinations, two per cent reading examinations, four per cent psychoneurotic examinations, and one school a common examination for all freshmen, called the College Board Examination. Reports on general health and personality are obtained by many of the schools. Forty per cent receive reports from the college health service, thirty-two per cent obtain personality ratings, and forty-four per cent obtain vocational and educational information regarding each student's plans as early in his college career as possible.

The majority of this material (such as intelligence tests, high school credentials, and placement examinations) is gathered at the time of college entrance. Biographical data are accumulated through the student's residence in college. This includes data such as athletic activity, non-athletic activity, offices held, honors won, and miscellaneous data regarding health, and discipline. Personality ratings are obtained as often as the personnel director or adviser desires them. Two ratings on each student in the sophomore and senior years will give a fairly accurate picture of the student's personality. Problem cases may require personality ratings more often. As yet only two schools use a psychoneurotic inventory, although three other schools indicated that they were thinking of using it for their problem cases.

The value of the personnel records to the student depends upon the degree of efficiency with which they are used. Although all schools gather some data regarding the student, only seventy-one per cent have the records available to student counselors, and only forty-eight per cent of the schools accumulate the records in one folder for the use of the counselor. All schools that accumulate the records in one folder have them available in original or duplicate forms for the counselor. The schools that gather the records in different departments, but do not assemble them, have the material available to the instructor if he desires it. No reason was given by the schools that do not have the records available for the counselor as to why they are not available.

Educational Information and Counsel.—Educational information and counsel is made available in an organized manner to the students in sixty-three per cent of the schools (Table VII).

TABLE VII

EDUCATIONAL INFORMATION AND COUNSEL

	Number	Per cent
Is educational information concerning nature of, and relationships between engineering curricula provided for all students? (Yes)	29	63
1. In planned and scheduled lectures	26	56
2. In engineering courses in the freshman year	26	56
3. Through suggested reading	17	37

Twenty-six schools use planned and scheduled lectures, twenty-six accomplish guidance through courses in the freshman year, and seventeen through suggested reading. Eighteen of the schools use two methods of providing educational information, and ten of these use all three methods. These last schools all, except one, have an attendance of over 800 students. Of the schools that use two or more methods, seven do not have courses in the freshman year. They do, however, give planned lectures to the freshmen. Thirteen schools use only one method of disseminating educational information. Four of these use planned and scheduled lectures, eight use engineering courses in the freshman year, and one suggests reading.

From the above data it appears that all schools who have an organized program of educational guidance, make an effort to aid the student in the freshman area. At Oregon State "The engineering problems courses . . . have been organized and developed for certain specific and general objectives . . . first, the orientation of the student with respect to the field of engineering; second, the development of appreciation of the close relationship between the various units of all engineering curricula; . . ."

Several other schools, such as the University of Washington and Iowa State, offer problems courses of a similar nature which include in their objectives educational guidance.

Educational guidance at the intermediate scholastic level is conducted through lectures by members of the engineering faculty, and by professional engineers. The latter lectures, if conducted in the right manner, are of especial value in motivating students in the study of subjects in which they should be particularly interested.

Seventeen schools (Table VIII) give complete personal counsel in the planning of student educational programs to all of their students.

TABLE VIII

EDUCATIONAL INFORMATION AND COUNSEL

Is personal counsel given in the planning of student educational programs?

To those requesting it	1 in upper classes
To students of low scholastic standing	1 in upper classes
To those requesting it and those of low scholastic standing	22
To all students	17
To freshmen	2 to all freshmen 3 who request it

Two other schools guide all of the freshmen in the planning of their course programs. Twenty-two schools aid all students of low

scholastic standing, and also any other students who request aid in arranging their programs. Three schools give help only as the freshman students request it. One school scored the questionnaire as giving no guidance whatever and added a footnote that some work was done with freshmen and sophomores. While all schools recognize the value of help to some degree, there is considerable variation in the amount offered. Notes appended to the replies indicate that the schools giving advice to those of low scholastic standing feel that the students not in difficulty will follow a regular program of study as given in the college catalog.

Vocational Information and Counsel.—Vocational information is recognized as desirable by engineering teachers. Replies to the questionnaire show that all schools are incorporating some form of guidance in their programs of training, while most schools are using two or more methods. The most common method used is inspection of and field trips to the various activities of engineering interest in the vicinity of the school. Thirty-four schools (Table IX) use this method. It is common practice to take the seniors on

TABLE IX

VOCATIONAL INFORMATION

Is vocational information concerning broadly differentiated engineering fields provided?	Number	Per cent
1. Through scheduled lectures	29	63
2. Through organized incorporation in engineering courses	16	35
3. Through incidental mention in courses	28	61
4. Through inspection trips	34	74
5. Through suggested reading	19	41

inspection trips. In the intermediate and freshman areas it is, however, effective as a motivating influence for further study, and also has some value as a means of educational guidance. Several schools indicated in footnotes that short inspection trips are taken by under classmen. It is doubtful, however, if this method of giving vocational information would be economical for large groups, such as are found in the freshman area, except in cases where the school is located close to the activities visited.

Twenty-nine schools schedule lectures especially designed to give students information concerning the various fields of engineering. The speakers for these lectures may be either practicing engineers brought to the schools by the deans or members of the school faculties. Sixteen schools incorporate guidance work in the organization of their courses, and twenty-eight recognize vocational counsel through mention in courses. Probably all schools use this method, at least instructors incidentally give guidance counsel. The incorporation of organized guidance occurs more frequently in

the freshman and senior courses. The freshman engineering orientation courses, which have developed in the last ten years, have held guidance as one of their specific objectives. Nineteen schools suggest books of a vocational guidance nature for students to read.

The replies indicate a difference in the counsel given on problems of individual vocational adjustment. Twenty-two schools (Table X) attempt to give counsel to those students who need it and to all who request it.

TABLE X

VOCATIONAL COUNSEL

Is personal counsel given upon problems of individual vocational adjustment?	
To those who need it	22 schools
To those requesting it in addition to those who need it	11 schools
To all students	10 schools

Ten schools give personal counsel upon problems of individual vocational adjustment to all students. Counsel of this kind can best be given by the advisers if they are qualified by their study and understanding of the problem. The smaller schools, that do not have an advisory system, give counsel through the dean and major department heads. Eleven schools have personal counsel available for those students who may request it. But make no attempt to discuss problems of individual adjustment with each students. The number of students enrolled at schools that offer counsel in this manner covers a wide range.

Engineering Discipline and Personality Development.—At least partial responsibility for development at the college level is recognized in many colleges of the country. Engineering schools recognize it particularly in the form of discipline in methods of and attitude toward work. The student of engineering is required to undergo a rigid training in good habits of work, such as accuracy, thoroughness, conciseness, and clarity. These habits are emphasized in the execution of all problem work and engineering reports which are presented to instructors. That most schools emphasize this training is shown by the replies to the questionnaire. Thirty-two schools emphasize the importance of personality development to the student. Fourteen of the schools do not emphasize it. Several stated that a more vigorous program of development is, however, under consideration by the faculty.

Among those schools that emphasize personality development, sixteen use a series of scheduled lectures (Table XI). Of these, eight use the lectures with incidental instructor contacts; three use the lectures and also incorporate personality development as a direct

objective in the courses and two incorporate personality development as an incidental objective in courses. Twenty-eight schools emphasize personality and habit development through incidental instructor contacts. Eleven schools use this means alone. Two schools use incidental instructor contacts and the incorporation of personality development as a direct objective in courses as a means of emphasizing habit formation. Five of twenty-eight schools combine incidental instructor contacts with personality development as an incidental objective in courses.

TABLE XI

PERSONALITY DEVELOPMENT AND HABIT FORMATION

Is the importance of personality and habit development emphasized?		Yes 32 / No 14				
		Through a series of scheduled lectures	Through incidental instructor contact	Incorporation in courses		Suggested reading
				Direct object.	Incident object.	
Suggested Reading			2			(7)
Incorporation in Courses	Incidental Objective	2	5			( ) Combined methods
	Direct Objective	2 (1)	2	2		
Incidental Instructor Contacts		8	11			
Scheduled Lectures		3				

Number of Schools,

Total using planned and schedule lectures 16
Total using incidental instructor contacts 28
Total using incorporation in courses
1. as a direct objective 6
2. as an incidental objective 7
Total using suggested reading 9

Six schools incorporate personality and habit development as direct objectives in their courses. Two schools use this method alone; four combine it with other methods. Seven schools give suggested reading in combination with two other methods. No school uses suggested reading alone.

Different ideas and methods of developing personal habits and social relationships can be gathered from the special activities of the different schools. Dean Anderson of Tulane University says

in part, "The importance of personality and habit development is not specially emphasized by means of lectures, but in a small college like this (329) the student comes into intimate contact with the heads of departments and ranking professors, and we believe in the principle that in the development of personality and character example is a stronger factor than precept." W. H. Timbie. Professor of Electrical Engineering at Massachusetts Institute of Technology, states "A course in Humanics, as an option in the group of general studies, open to juniors and seniors, gives a special consideration of personal problems and the development of personality." Northeastern University (1,659 students) makes the following comment regarding their cases needing personal help and the method of locating the more serious ones, "Severe cases of scholastic failure, discipline, and problems of general social adjustment are referred to a mental hygienist, a full time member of the faculty, . . . Occurring more frequently, however, are cases of inferior study techniques, poorly developed life purposes, unwholesome parent-child relationships, poor attitudes toward authority, handicapping personality traits, and debilitating emotional conflicts of various kinds. . . . In many cases the work of the mental hygiene officer is chiefly that of fact finding, the solution of the student's problem resting in the hands of others of the university."

A number of schools believe in the value of personal counsel upon individual problems of personality development. Eight schools give this service to all students (Table XII) through their

TABLE XII

PERSONAL COUNSEL

Is personal counsel given upon individual problems of personality development?

To all students	8 schools
To all students of low personality rating and to others who request it	13 schools
To only those who request counsel	18 schools
No answer	7 schools

system of advisers. Thirteen schools give personal counsel to all students of low personality rating, and also other students who request it. Eighteen other schools give individual counsel only as students request it. Seven schools give no individual help whatever to the student.

Student professional and other societies are organized in most schools, with at least one of their objectives—to improve and develop good personal, social, and professional habits. Eighty-

three per cent endeavor to develop the student's interest in general professional matters (Table XIII). A large number, of course, devote time to technical matters. Professional and technical interests are easily created through active student chapters of the American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and other societies and provide a beginning point for personality development under the direction of faculty members. Forty-eight per cent of the schools attempt to create student interest in cultural fields through their student professional societies.

TABLE XIII

PERSONALITY DEVELOPMENT IN EXTRA-CURRICULAR ACTIVITIES

Are student professional and other societies used in an organized manner to direct and stimulate student interest and development?

1. In technical matters	(Yes)	36 schools
2. In general professional matters	(Yes)	38 schools
3. In cultural fields	(Yes)	22 schools
4. Incidentally	(Yes)	1 school

Placement.—Of all the forms of personnel work surveyed by the questionnaire, placement is the one division in which all of the schools are interested. Forty-three schools (Table XIV), or ninety-three per cent, make a definite effort to place their students at graduation. On the other hand, only thirty-six, or seventy-eight per cent, make an effort to place students on summer work in their undergraduate years. Fourteen of the schools prepare a biographical outline of the training and experience of each student for the

TABLE XIV

PLACEMENT

		Number	Per cent
1. Is an effort made to place all students at graduation?	(Yes)	43	93
2. Is an effort made to place students on summer work?	(Yes)	36	78
3. Do you prepare a biographical outline of the training and experience of each student for presentation to prospective employers?	(Yes)	14	30
4. Do you arrange interviews between industrial representatives and students?	(Yes)	44	96
5. Does your faculty make opportunities for placement through personal contacts with industry?	(Yes)	44	96
6. Have you compiled a library of information upon the nature of and opportunities in industrial organizations?	(Yes)	16	35
7. Do you coach your students for the civil service examinations?	(Yes)	10	22
8. Do you provide organized employment service for alumni after the first placement?	(Yes)	24	52

use of the prospective employers. Twenty-nine of the schools that make an effort to place students at graduation make no effort to assemble data which will aid the industrial representatives in making their selections, but leave the representative to collect the desired data through personal interviews with the student and faculty members.

Forty-four, or ninety-six per cent, of the schools arrange for interviews between industrial representatives and their graduates. One school in this group makes these arrangements at the request of the representatives from the industries but makes no other direct effort to help the student or the representatives. The individual faculty members of this same group of forty-four schools are making contacts with the industrial organizations in an attempt to develop opportunities for the placement of their students.

In addition to those placement activities mentioned, some schools carry on more extensive programs for the benefit of their graduates. Sixteen have compiled libraries of information upon the nature of and opportunities in industrial organizations. Ten coach their students for the civil service examinations. Twenty-four of the schools provide an organized employment service for their alumni after graduation.

Research.—Nine schools indicated that research work in personnel problems is being carried on in their institutions. Twenty-three replied that no work was being done. Various problems are under way in the schools interested in personnel research, some of which are (1) The Significance of Slow Reading Ability; (2) The Construction of Drawing and Physics Placement Examinations; (3) A Study of the Effect of Mid-term Follow-up, Personal Interviews on the Stability of Mid-term Grades; (4) An Evaluation of the Benefit of a Psychology Course, a no credit course for students on probation; (5) many smaller Studies in Ability and Achievement; (6) Studies with Reference to Sectioning Students on the Basis of Ability.

Summary of Survey Data

I. *Administration:*

A. Organization

1. The data indicate that engineering schools in large part retain within their organizations the administrative control of organized personnel services.
2. Personnel work is accomplished through individual efforts of the faculty in those schools which have no formally organized service.

B. Counsellors
   1. Some organized form of counselling students is used by the majority of engineering schools.
   2. The work of the advisers is supervised and coördinated by some administrator in the majority of engineering schools.
   3. The advisers are engineering instructors in contact with classes in sixty-five per cent of the schools.
   4. Committee conference and individual direction are methods used most frequently to bring advisers to a common understanding of their problems.

C. Problem Cases
   About one-half of the engineering schools refer problem cases to other departments such as the psychological clinic, health service, and scholarship committee.

D. Placement
   1. Placement service is under direct control of the dean or department heads in all except eight engineering schools.

II. *Individual Studies and Records:*

A. The more important records, some of which are kept by all schools, are (1) high school credentials, (2) biographical data, (3) intelligence tests, (4) mathematics and English placement examinations, (5) health service reports, (6) interest inventories.

B. Seventy-one per cent of the schools make the personal records available to the student counselor.

III. *Educational Information and Counsel:*

A. All schools that have organized personnel service give educational information and counsel in the freshman year by means of planned and scheduled lectures, or in engineering courses in the freshman year. Many of the schools use both methods.

B. Less than one-half of the schools give complete guidance to all students in the planning of educational programs.

C. Practically all schools give counsel to students who have low scholastic standings.

IV. *Vocational Information and Counsel:*

A. Some form of vocational information and counsel is given by all schools. The methods most favored are, sched-

uled lectures, inspection trips, and incidental mention in courses. Most schools use two or more methods.

B. Only ten schools give vocational information in a systematic manner to all students. Twenty-two other schools, however, give it to those who are thought to need it.

V. *Personality Development:*

A. Thirty-two schools emphasize personality development; others are considering a more purposeful plan of personality development for their students.

B. Counsel of a personal nature is conducted most frequently through incidental instructor contacts. This method and a series of scheduled lectures are used in all of the schools excepting two. One method used by a number of instructors is to incorporate personality development as an objective in courses.

C. Individual problems of personality development are recognized by many schools. Only eight schools, however, attempt to counsel all students upon such development. Others leave counsel to the initiative of the student, and thirteen schools give counsel to all students of low personality ratings.

D. Practically all schools use professional and honorary societies to develop students in professional and technical matters. Twenty-two use these societies to develop students in cultural fields.

VI. *Placement:*

A. Placement service is given to graduates by ninety-three per cent of the schools. Various means are developed by the faculty for making contacts with the industries, and for aiding the industrial representatives in making their selections.

B. A large number of schools (36) attempt to place students on summer work.

C. Fifty per cent have an alumni placement service, and twenty-two per cent coach for the civil service examinations.

VII. *Research:*

Few schools of engineering are working upon research problems in personnel; however, some are making rather extensive studies on placement examinations, and on eliminations of students.

Philosophy and Evaluation of Personnel Service

Premises.—Any critical study or evaluation of educational forces or services must begin with certain clear premises and criteria as a basis of analyses or judgment. In the field of personnel service in engineering colleges the premises underlying a study of the procedures and techniques are the recognition of partial responsibility for the total development of the individual and for harmony between his choices and his capacities, together with the recognition of a unique responsibility for placement at least in so far as the number and kind of graduates from engineering colleges are related to the number and kind of positions available. The organization of personnel services has been stimulated by a growing sense of these responsibilities and by the success of certain similar departments in industry, as well as by the development of certain techniques for obtaining more or less meaningful outlines of human capacities and abilities which have been used both in the colleges and in industry.

Purpose of Personnel Services.—The general function of the personnel service is to give a uniform and concerted individual service to all students in the development of more complete personality. The specific purposes of personnel service may be classified as follows: (1) individually to assist each student in his educational, vocational, and avocational choices with due regard for his qualifications of intellect and ability and of motives and interests which find expression in his character and personality; (2) to counsel each student in the mobilization of his emotional attitudes around feasible ambitions and to check him in their crystallization around vague aims which are impossible of realization; (3) to direct each student toward an appreciation and understanding of the personal and social forces contributing towards success and to stimulate each student in the development of desirable personal traits; and (4) to give purpose and unity to all college and educational experiences.

An important element in the success of personal service throughout the period of student training is the personal understanding between a student and his advisors. A personnel service seeks to replace the "hit and miss" educational and vocational experiences with thoughtfully considered programs directed toward the highest self-development of each student. It seeks to supplement the formal phases of class room contacts with faculty members by an individual and personal contact with selected members providing understanding, counsel, human appreciation, and inspiration which will stimulate students to an intellectual approach to the solution of their personal problems. To accomplish these objectives faculty

advisers must be qualified by a critical understanding of human nature and a sympathy and charity for it, by a broad understanding and appreciation of life and of engineering, and by the knowledge of methods for a thorough and orderly approach to the solution of both intellectual and emotional problems encountered in the adjustment of a student to his environment and life career.

Student Nature.—A thorough and critical understanding of student nature requires a broad knowledge of psychology and sociology together with thoughtfully considered critical experiences in the solution of student problems as well as an understanding of those techniques and procedures which may be of value in the solution of these problems. The problems of subnormal and abnormal students require knowledge and experience that the engineering instructor will rarely have opportunity to get. Problems of normal students should, however, be met by all worthy engineering instructors who will give the time and study necessary to master the organized knowledge and techniques of personnel service and the basic principles of psychology.

In recent years many tests have been developed and tried in the field of intellectual measurements. One test of apparent merit has been developed in the field of vocational interest by Dr. E. K. Strong, Jr., of Stanford. Many rating scales have been developed for the purpose of obtaining a subjective estimate of character and personality and many aptitude tests are available. There is need for the development of a more complete and better coördinated battery of diagnostic tests measuring intellect and abilities on the one hand and motives and interests on the other which will make it possible more completely to harmonize these in the student and to remedy maladjustments frequently found. These two phases of human nature, the intellect and the motive, find expression. moreover, in the character and personality of the student which can be observed in his activities of an educational, vocational, and avocational nature and can be measured subjectively by personality ratings.

Differentiation of Needs and Areas.—There are three areas in which the normal student needs rather distinctive assistance and counsel in selecting and controlling his educational, vocational, and avocational experiences and training. They are (1) the freshman area in which the major problems are educational adjustment and a mobilization of motives about worthy objectives, (2) the intermediate area between the freshman year and graduate placement in which the problems are those of personal development and educational progress, and (3) the senior area in which the problems are vocational selection and placement.

In 1930 the committee on Instruction in Agriculture, Home Economics, and Mechanic Arts of the Association of Land Grant Colleges and Universities made A SURVEY OF PERSONAL CONTACTS IN THE FRESHMAN AREA which is available in mimeographed form through the coöperative extension office of the U. S. Department of Agriculture at Washington, D. C. This investigation covered the pre-college guidance programs, freshman week, orientation courses, personnel records, guidance officers, interview sections, health work with freshmen, and courses for freshmen on "How to Study." The report indicated that considerable thought is being given the organization of more effective programs of handling students, at least on the freshman level. Since the report of the Land Grant Colleges and Universities committee covered the pre-college guidance program rather effectively and since the engineering schools do not control the pre-college programs of guidance and contacts but participate in them together with other institutional units under the direction of centralized offices, the concern of engineering educators is primarily with those phases of personnel work which are begun after registration and sometime during freshman week.

PROCEDURES AND PRACTICES

Problems of Freshman Area.—A program for "freshman week," which has permitted new students to become oriented to their college environment and has given opportunity for intelligence tests and placements tests for the purpose of sectioning classes, has been adopted and is being developed in many institutions. It has been approved quite generally by faculty and students alike. In general it is, however, under the direction of officers outside of the engineering organization and the personnel problems of the engineering school, therefore, begin either with the articulation of placement examinations in the freshman week program or with the later problems of impending scholastic failure.

Scholastic failures among freshmen may be caused by a wide variety of conditions and circumstances. Among those most frequently encountered are (1) lack of capacity and ability, (2) lack of interest and motive, (3) poor preparation, (4) handicapping personality traits, (5) inferior study techniques and conditions, (6) demands of self-support, (7) extra-curricular activities, (8) health, and (9) destructive emotional conflicts. Diagnostic and remedial tests which can be administered by the conscientious and trained engineering advisers are available for all of these but the last four. The demands of self-support and of extra-curricular activities may, however, be obtained in conference and recorded upon cumulative record forms.

In most institutions agencies outside of the personnel service have been set up for the purpose of treating and correcting ill health and destructive emotional conflicts. The health problems are being solved by the increasingly efficient health services maintained in most institutions and destructive emotional conflicts and anti-social adjustments are being diagnosed and to some extent corrected by the techniques of psychology, psychiatry, and mental hygiene. Departments for the provision of these last services have been established in many institutions and engineering advisers should prepare themselves to recognize emotional maladjustments and refer them to those qualified to treat them.

Intelligence and aptitude tests are available in large numbers for measuring achievement and ability but very few tests are available for the measurement of interest and so far as the committee knows no tests of engineering motives are available to engineering schools. Poor preparation may be measured by high school records and placement tests. Many handicapping personality traits can be determined and classified by personality ratings. A few schools have inventories for searching out inferior study techniques and conditions. Northwestern University probably has one of the best of these. At the present time no complete battery of tests for diagnosing probable scholastic failures can be recommended as entirely satisfactory yet progress is being made each year in the organization, development, and validity of those tests available. The tests available together with instructors' reports may be used with good certainty to indicate impending freshmen failures.

In addition to these services for the freshman in difficulty, many institutions are extending information and guidance to those well qualified to carry collegiate work through educational counsel and orientation and engineering problems courses. These services have been developed in a variety of forms in most institutions for a variety of purposes. Among the most common objectives of such courses are (1) orientation to the field of engineering, (2) orientation to engineering courses and curricula, (3) discipline in engineering methods and habits, and (4) instruction in certain elementary tool principles. The orientation work is proving effective in directing student understanding and developing interest and enthusiasm. The engineering problem courses are used most frequently for inculcating habits of high standard in workmanship and general engineering attitudes and ideals.

Intermediate Area.—Problems of the intermediate area are similar to those of the freshman area with a passing of emphasis from the correction of destructive and retarding forces to emphasis upon constructive and developing forces. The development of intellectual and technical abilities, the arousing and stimulating of

enduring interests and motives, the expression and development of fuller personality and character, the focusing and strengthening of life purposes, begin, therefore, to dominate the objectives of the services rendered in this area.

The same diagnostic and remedial techniques are available and cumulative records give more objective evidence of character and personality which have been expressed in activities of an educational, vocational, and avocational nature. The greatest emphasis of the personnel service should here be placed upon the personality development of students. Educational programs, extra-curricula activities and adviser contacts should be used to broaden and enrich the student's experiences and personality. These purposes can and should be coördinated with training in engineering science and technology and discipline in engineering habits and methods.

Senior Area.—In the senior area the personnel emphasis again changes to counsel in educational specialization, information upon vocational opportunities, and placement in avenues of life careers. Educational counsel is most frequently given by heads of major departments in this area. Vocational information is made available in some institutions by a library of compiled data upon and descriptions of opportunities and activities in industrial organizations. It is also frequently disseminated in lectures describing the functional and vocational divisions of industry and engineering. Many schools have organized programs for this purpose.

The placement services rendered are of a wide variety in nature. Some schools coach seniors for civil service examinations; most schools provide for interviews with industrial representatives and seek faculty contacts that will open opportunities for placement. Some schools prepare biographical outlines of training and experience of all graduates or those who request it and are willing to pay for it, for placement through correspondence. These services are all very helpful to the graduates and are usually very much appreciated. They keep the schools informed upon the capacity of the field to absorb its product. Cumulative personnel records give quick and ready access to a full description of each student for the purpose of extending counsel to him or providing data and information to prospective employers.

In addition to these organized personnel services many informal services and developing conditions may be thrown around students in the senior area. Student theses written for the purpose not necessarily of contributing to scientific knowledge but of developing students are again being used by many institutions and are stimulated by prizes offered through the local or national founder society groups. Professional interest and enthusiasm are being developed by exchange programs and contacts with these groups and by visits

to and inspections of industry and construction. All of these services have proven their worth through years of experience and trial in engineering schools.

Organization and Technique

Types of Organization.—Many forms of administrative organization for personnel services are found in engineering schools, which probably indicates that the mechanism, the administrative form itself, is less important and that the service is the vital and significant thing in personnel work. This service can, however, only be established and obtained through responsible and informed leadership, close coördination, and continual supervision. The work of advising and assisting a large group of students registered in engineering seems to be best done by incorporating it into the responsibilities of some members of the teaching staff and decentralized organizations are, therefore, most common.

Perhaps the most important element in the success of personnel service is the personal contact between students and those acting as their advisers. If this personal contact with an understanding human interest and sympathy is to be secured, the personnel system must include those instructors who are able to develop an understanding of human problems; and these men must be selected from among those who teach technical and engineering courses. These considerations indicate the need for a study of personal problems and services by faculty advisers and also indicate the responsibility of leadership, coördination, and supervision if uniform and constructive results are to be obtained.

Responsibilities of Organization.—The responsibility of the personnel organization and its director are (1) to provide the techniques and tools for diagnostic and remedial measure, (2) to train counselors to use these techniques and record results, (3) to supervise the collection and completion of all records and to have them kept up-to-date, (4) to make records available for the use of all counselors, teachers and school administrators, (5) to direct and coördinate all educational information and counsel, (6) to coördinate vocational information and methods of placement, (7) to unify all engineering school procedures and practices and to coordinate these with other institutional divisions and services such as the health department, the psychological clinic, and the scholarship and disciplinary committees, and (8) to perform studies leading to constructive improvements in the personal service itself. Some placement services are under the direction of an appointment bureau and need to be coördinated with the personnel service. All of the above functions are performed in a variety of manners.

Some institutions provide manuals for directing and coördinating the work of counselors, and one provides an advisers calendar designating the days upon which certain work and services must be done or completed. Since the success of a personnel service depends very largely upon its leadership and supervision it is reasonable to conclude that if men already employed in our engineering schools are to direct it the organization must be adapted to the personalities of the director and counselors. Whatever its form, however, the services provided by it should make use of the knowledge, developments, and technique available in the field of service.

Techniques.—The effective guidance of a student in his educational, vocational, and avocational choices requires a careful and thorough diagnosis of his abilities, achievements, and dominant interests, and a prescription which will contribute to his prospects for success with some predictable degree of accuracy. Although tests have not been developed completely enough to give comprehensive pictures of capacity, personality, and motives many tests of certain elements of individuality are available for use. Fairly meaningful diagnoses and inventories of capacities, abilities, achievements, interests, and character as they are determined and conditioned by the intellectual and emotional nature of each student can be obtained with tests available. With such data and a personal knowledge from contacts, advisers can assist students in an intellectual approach to and choice of feasible and valid educational, vocational, and avocational goals. The most important quality of any test is its reliability. Reliability can only be determined by standardization and tests of validity.

Mental and Placement Tests.—A large number of intelligence, aptitude, and achievement tests are available and may be selected at the discretion of the personnel director. Tests of this type are used more widely than any others. Many placement examinations are available and are being used in increasing numbers. Their relative merits seem to be recognized by engineering schools in the following order: English, mathematics, physics, chemistry, and drawing. These tests likewise may be selected with considerable latitude at the discretion of responsible officers.

Interest and Motives Inventories.—Few inventories of interest are available for use by student counselors. They seem, however, to provide useful techniques for diagnosing the troubles of maladjusted students. At the request and with the assistance of the Engineering Foundation, Dr. Edward K. Strong, Jr., of Stanford University, prepared an interest inventory which he has attempted to standardize for a large number of occupations, such as those of advertisers, architects, artists, certified public accountants, chemists, doctors, farmers, journalists, lawyers, ministers, and engineers.

The reliability of the test which was standardized upon mature interests may be questioned when applied to the interests of engineering students but several schools have used it with some degree of satisfactory results.

There is need for the development of a test giving some quantitative inventory of engineering motives at the time of entrance to college. These motives seem to be constructive instinct, scientific curiosity, pleasure in abstract analysis, zest for precise observation and description, satisfaction in practical application, enjoyment in planning and organization, and delight in manual skill and activity. One institution is now experimenting with such an inventory. The motives stimulating mature engineers may perhaps be quite different from these. Certainly the more dominant ones in mature years would be professional esteem, financial gain, professional ideals, engineering habits, critical understanding, constructive accomplishment, and creative ideas. The field for the study of these offers opportunity for constructive contributions.

Personality Rating.—Perhaps no tests or rating scales are more varied than the personality ratings used in engineering and other schools. Many rating scales simply list personality traits and ask the scorer for a graduated estimate of a comparative nature. The forms of other scales seem to indicate that a somewhat quantitative measure of personality traits may be best obtained by answers to brief statements of actions and attitudes manifested.

The traits listed upon practically all personality rating scales may be classified under various headings as follows:

Traits Manifested Toward Fellows:
1. Address and Manners
2. Leadership and Coöperation

Traits Manifested Toward Work:
1. Initiative and originality
2. Purpose and Industry

General Intellectual and Emotional Traits:
1. General Judgment and Common Sense
2. General Attitude and Disposition

Standards of Performance:
1. Engineering Workmanship
2. English Usage

Most personality rating scales include those traits manifested toward fellows and toward work, as well as those of general attitude and disposition. Some include an estimate of general judgment and common sense, and one or two include an estimate of standards of workmanship and English usage. Some blanks also include

statements of moral character but in general this factor seems to be cared for by the record of disciplinary action upon the cumulative record card.

The development of sound and good traits manifested toward work and of high standards of performance are so definitely a part of each instructors responsibility to his class that it is impossible to separate personality development from scholastic training. This integral responsibility makes the coördination of personnel service and instruction for the normal student inevitable.

Miscellaneous Tests and Reports.—A number of miscellaneous tests and reports of various natures are collected in different institutions. Among these are inventories of inferior study habits and conditions, psychoneurotic inventories, health service reports, reading tests, and many special college examinations. The reading tests have been designated by some as giving the most reliable correlation with scholastic achievements.

Cumulative Records.—A permanent cumulative personnel record is a means for stating concretely objective data upon important aspects of student development and of recording fairly complete and significant outlines of student achievement. No single bit of information can be used as an index of a young man's ability and interest, but a comprehensive record extending over a period of years can be made to describe his interests and bents with dependable accuracy. Cumulative records provide methods for segregating personnel data and making it available to those who are responsible for the counseling of students. The cumulative record usually includes general data giving a students identity, educational accomplishments and plans, vocational experiences and objectives, and avocational interests and activities together with records of scholastic achievements and scores upon standardized tests and ratings. The important thing in the use of the cumulative records is that they be available for use by all student counselors, teachers, employers and administrative officers and that they be kept up-to-date at all times.

Conclusion

The greatest values of an organized personnel system as distinct from informal personal counsel are obtained through the training of counselors and the improved ability given them for advising students and are established by the certainty of coördinated and uniform counsel. An organized personnel system of trained and coördinated advisers assures contact with every student and distributes the benefits of counsel to all students. It should materially promote the development of capacity, personality, and motives, the

component forces of dynamic and vital individuality. Through the personal interest in students developed by and inherent in the personnel system a spirit of coöperation between faculty and students and general esprit de corp may be developed in an engineering school. This reaction upon the staff and student body growing out of sincere and understanding service is a very vital and stimulating force. Every engineering school should approach its personnel problems in a well ordered and thoughtfully considered manner and should facilitate its service by the use of those techniques and procedures that have proved to be reliable and valid through years of experience and trial.

The general development of personnel systems in American Colleges is proceeding so rapidly that delay in the organization and development of such services within engineering schools may find their control in the hands of agencies other than engineering administrators and the services provided materially reduced in value by their separation from engineering instruction and leadership. The evolution of student welfare service in colleges seems to be toward a centralization of all those services which have to do with health, hygiene, and physical education into one organization and a centralization of those functions of the deans of men and women, of the scholarship and disciplinary committees, of general placement service, and similar functions into another organization. The engineering schools may be coördinated and should coöperate with these broader services; they will, however, render the greatest service if they develop strong personnel services under engineering leadership and direction as an integral part of the engineering training and responsibility of the engineering staff.

Experience obtained in schools with well-developed personnel methods indicates that students in need of personnel service cannot be counted on to seek it out, even when general or individual invitations are extended; this is particularly true of those with personal maladjustments of emotional and other kinds, but it holds for those in scholastic difficulties as well. Personnel officers must learn that on them lies the responsibility, in many cases, of taking the initiative at an early stage, and opening up problem cases for diagnosis and remedy. Informal personnel programs operating on the assumption that "if a student is in trouble he will seek help," are based on too sanguine hopes. The widely needed and most effective personnel service will not be provided until the large majority of organized programs extend more initiative and provide more understanding service.

LETTER TO S. P. E. E. REPRESENTATIVES

S. P. E. E. COMMITTEE ON PERSONNEL METHODS IN USE IN ENGINEERING SCHOOLS

Dear Sir:

Enclosed is a copy of the questionnaire prepared by the Committee on Personnel Methods in Use in Engineering Schools appointed by Dr. H. S. Boardman, president of the S. P. E. E.

Will you please score the questionnaire for your school and return it in the enclosed self-addressed envelope by May 1, 1931.

In order to make the study as complete as possible the Committee would like copies of all forms used in personnel work. Will you please mail copies of your forms to H. S. Rogers, Oregon State College.

The Committee will appreciate your coöperation in aiding the work of the survey.

Very truly yours,

H. S. ROGERS,
Chairman.

Committee of the

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION

QUESTIONNAIRE ON PERSONNEL METHODS IN USE IN ENGINEERING SCHOOLS

Institution .....

Total Engineering Enrollment ..... Date .....

Recorded by .....
(S. P. E. E. Representative)

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EXPLANATIONS

During the current year a Committee on Personnel Methods in Use in Engineering Schools was appointed by Dr. H. S. Boardman to survey the methods at present in use, to outline a more or less general philosophy of personnel service, and to recommend certain general procedures, in a report to be presented at the June meeting of the S. P. E. E. at Purdue. The committee has decided to study the methods used in all engineering schools holding institutional membership in the S. P. E. E. It is, therefore, sending this questionnaire to the institutional representatives of the S. P. E. E. in each of these schools.

Will you please answer the questions by a check indicating yes or no in the appropriate brackets? If you have any special information or desire to make any comment which, in your judgment, will help the work of the committee please record it under paragraph VII. The committee will appreciate your coöperation in returning promptly the questionnaire to the chairman.

C. V. MANN, Missouri School of Mines,
A. D. MOORE, University of Michigan,
J. E. WALTERS, Purdue University,
G. W. HOLCOMB, Oregon State College,
H. S. ROGERS, Chairman, Oregon State College.

I. ADMINISTRATION

	Yes	No
A. Do you have an organized engineering personnel system?	( )	( )
B. Is it organized:		
1. As a subordinate unit of a general institutional system,	( )	( )
2. As a coordinate unit with other divisional units, of an institutional system,	( )	( )
3. As an independent system?	( )	( )
C. Is it directed:		
1. By personnel officer,	( )	( )
2. By faculty committee,	( )	( )
3. By heads of major departments,	( )	( )
4. By Dean or Junior Dean?	( )	( )
D. Do you have assigned advisors for engineering students?	( )	( )
E. Who are these advisors:		
1. Engineering instructors in contact through classes,	( )	( )
2. Administrators in engineering departments,	( )	( )
3. Members of engineering school personnel office,	( )	( )
4. Members of central personnel office?	( )	( )
F. Who coördinates the work of the assigned advisors:		
1. Head of freshman engineering, and, or, heads of major academic departments,	( )	( )
2. Dean, and, or, Junior Dean of Engineering,	( )	( )
3. Personnel director,	( )	( )
4. No attempt at coördination?	( )	( )
G. Are any steps undertaken to bring advisors to common understanding of problems and methods of personal counseling:	( )	( )
1. Through committee conference,	( )	( )
2. Through special bulletins,	( )	( )
3. Through individual direction?	( )	( )
4. List other methods _____		
_____		
H. Are problem cases in student adjustment referred to other departments?	( )	( )
I. To which departments do you refer problem cases:		
1. Psychological clinic,	( )	( )
2. Health service,	( )	( )
3. Scholarship committee?	( )	( )
4. List other departments _____		
_____		
J. Do you have a placement service as a unit of the personnel system?	( )	( )

K. Who directs the placement service:

1. Central personnel officer,	( )	( )
2. Officer independent of personnel service,	( )	( )
3. Dean of engineering,	( )	( )
4. Heads of major departments?	( )	( )
5. List other officers _____		

II. Individual Studies and Records

	Yes	No
A. Which of the following student records are collected in the institution for personnel work:		
1. High School credentials,	( )	( )
2. Biographical data,	( )	( )
3. Intelligence tests,	( )	( )
4. Placement examinations,		
Mathematics,	( )	( )
English,	( )	( )
Physics,	( )	( )
Drawing,	( )	( )
5. Interest inventory,	( )	( )
6. Psychoneurotic inventory,	( )	( )
7. Other tests or inventories, _____		
8. Health service report,	( )	( )
9. Personality rating,	( )	( )
10. General data on vocational and educational plans?	( )	( )
B. Are all records of each student accumulated in one folder?	( )	( )
C. Are these records used by student counselors?	( )	( )

III. Educational Information and Counsel

A. Is educational information concerning the nature of, and relationships between engineering curricula provided for *all* students:	( )	( )
1. In planned and scheduled lectures,	( )	( )
2. In engineering courses in the freshman year,	( )	( )
3. Through suggested reading?	( )	( )
B. Is personal counsel given in the planning of student educational programs:		
1. To all students,	( )	( )
2. To students of low scholastic standing,	( )	( )
3. To those requesting it?	( )	( )

IV. Vocational Information and Counsel

A. Is vocational information concerning broadly differentiated engineering fields provided:		
1. Through scheduled lectures,	( )	( )
2. Through organized incorporation in engineering courses,	( )	( )
3. Through incidental mention in courses,	( )	( )
4. Through inspection trips,	( )	( )
5. Through suggested reading?	( )	( )
B. Is personal counsel given upon problems of individual vocational adjustment:		
1. To all students,	( )	( )

2. To those requesting it, ( ) ( )
3. To those who need it? ( ) ( )

V. Personality Development and Social Relationships

	Yes	No
A. Is the importance of personality and habit development emphasized:	( )	( )
1. Through a series of scheduled lectures,	( )	( )
2. Through incidental instructor contacts,	( )	( )
3. By incorporation in courses,	( )	( )
As a direct objective,	( )	( )
As an incidental objective,	( )	( )
4. By suggested reading?	( )	( )
B. Is personal counsel given upon individual problems of personality development:		
1. To all students,	( )	( )
2. To all students of low personality rating,	( )	( )
3. To those requesting it?	( )	( )
C. Are student professional and other societies used in an organized manner to direct and stimulate student interest and development:		
1. In technical matters,	( )	( )
2. In general professional matters,	( )	( )
3. In cultural fields?	( )	( )

VI. Placement

A. Is an effort made to place all students at graduation?	( )	( )
B. Is an effort made to place students on summer work?	( )	( )
C. Do you prepare a biographical outline of the training and experience of each student for presentation to prospective employers?	( )	( )
D. Do you arrange interviews between industrial representatives and students?	( )	( )
E. Does your faculty make opportunities for placement through personal contacts with industry?	( )	( )
F. Have you compiled a library of information upon the nature of and opportunities in industrial organizations?	( )	( )
G. Do you coach your students for the civil service examinations?	( )	( )
H. Do you provide organized employment service for alumni after the first placement?	( )	( )

VII. Special Methods and Comments

(Please give any additional information or comment which you desire)

	Yes	No
Are you doing any organized research in personnel problems?	( )	( )

What personnel research have you completed .....
.....
.....
What personnel research have you in progress .....
.....
.....

INSPECTION TRIPS *

By HAROLD E. BABBITT

University of Illinois

Advice on how to select a wife is about as easy to give and is as valuable as advice on how to conduct an inspection trip. There are so many factors involved, so many different conditions to be considered, so many different points of view to observe, that rules which are applicable in one place may be completely unsuited elsewhere. Differences of opinion on the value of inspection trips are as outspoken as on prohibition and are sometimes voiced with as little knowledge. Much heat may be generated in the discussion, but little light is shed on the subject.

Before discussing inspection trips at length the question: *"Are inspection trips justified"?* should be answered. To answer the question fairly requires an understanding of the meaning of the term inspection trip. For the purpose of this discussion it will be understood that an inspection trip involves a visit to a place of instructional value for the purpose of acquiring knowledge through observation. In some colleges the term shop visit or shop trip is used synonymously to the term inspection trip. The justification of an inspection trip is contained in its definition for, as stated therein, it is a visit to a place of instructional value for the purpose of acquiring knowledge through observation.

Demonstration of the value of inspection trips next demands proof that more instruction can be secured by a visit to places of instructional value than by spending the same time in the class room or laboratory. Proof of the greater instructional value of inspection trips is presented by the practice of many educational institutions in requiring participation in trips. In addition to trips required for graduation in many curricula, informal trips are taken by classes under the guidance of an instructor, the inspection trip merging into a field trip or an outdoor laboratory exercise. The discussion in this paper is primarily concerned with the formal, required inspection trip of two or more days' duration. In studying the records of those engineering schools which do not include such long, required trips in their curricula it is to be noted that most of such institutions are located in or very near to large in-

* Presented at the 39th annual meeting S. P. E. E., Purdue University, June 17–19, 1931.

dustrial centers where half-day trips can be made conveniently. Nearly all large engineering colleges in more remote localities require participation in a long inspection trip. From the number of schools which include this requirement it is evident that experience and practice point conclusively to the value of inspection trips in education.

When Should the Trip be Taken

From an instructional point of view is it better to make the trip before or after instruction is given in the fields covered by the trip? Trips are usually required during one or both of the last two years of instruction. When required during both of the last two years the itineraries are varied in alternate years so that there is no undesirable repetition for the student. In general, the trip should be taken shortly after the beginning of the school year, for of all the useless times to conduct an inspection trip the end of the senior year is the most valueless. The eyes of the senior are turned towards his job which may have little in relation to the sights of the trip, and the junior is more interested in his summer plans. A student's eyes are turned ahead, not backwards, and if the trip follows instruction attention to the details of the trip will be neglected.

Visual instruction and knowledge gained through observation during a trip are of inestimable value subsequently in the lecture, the design, and the class room. The instructor is able to say to his students: "You remember the sewer junction chamber we saw in St. Louis? Then design one about half of that size." Possibly a student will ask such a question as "What is a bear trap dam?" The instructor will find it easier to say: "The dam we saw at Lockport is a bear trap dam," rather than to attempt a word picture, a sketch on the board, or a reference to an article; and the answer is far more satisfactory to the student.

Through observation the student gains a perspective of sizes, dimensions, and practices; ideas which crowd in on his perceptions so rapidly during the trip that he fails to appreciate them at the time are recalled when needed in his later courses. Experience in teaching design courses is convincing of the indispensible adjunct which knowledge gained on inspection trips is to such courses and is convincing of the truth of the proposition that a trip must be taken before the course is presented.

Let us reverse the thought to discover the benefits and advantages of taking a trip after instruction has been given in the subjects covered by the trip. The immediate value of the trip is increased. More things are seen and appreciated by the observer. After the expenditure of effort in the class room there has been

planted in the student's mind certain definite ideas concerning practice. For example, in the class room the student may have been taught what an outside, center-packed, plunger pump is. All unknown to the instructor his idea of it is warped or erroneous. In standing before the machine the instructor will say: "This is an outside, center-packed, plunger pump such as we were discussing last month." In one astonished "Oh" the student will acknowledge the dawning of a complete conception and understanding of the machine. It is evidently possible to secure more from the trip following rather than preceding instruction but the greater advantage still rests with a trip preceding instruction as lecture, quiz, and design are greatly simplified, and more subject matter can be covered with less effort. Experience and practice answer "take the trip preceding instruction."

Preliminary Instruction

It is possible to secure the advantages of a trip preceding instruction and some of the advantages of a trip following instruction by preliminary instruction concerning the places to be visited. Preliminary instruction is commonly neglected and the neglect is a serious defect in the conduct of a trip. The preliminary instruction may be overlooked because of ignorance of details of the places to be visited. In view of the expense usually involved in an inspection trip the cost of gathering information on the plants and places to be visited is more than justified.

Each student should be provided with an itinerary of the trip containing not only orders concerning deportment and meeting places, but also illustrated descriptions of the places to be visited. He should be given instruction on the features of the plants or places to be visited, what to look for, what to see, and what to ask about.

Advance Information

No inspection trip can develop its full possibilities unless adequately planned in advance. Plans for certain visits can be made satisfactorily by correspondence when the place to be visited is of a permanent nature, the instructor-in-charge is acquainted with the plant and its management, and the inspecting party is welcome. To make complete plans by correspondence alone for visits to construction work or to strange places is to court embarrassment, disappointment, and perhaps disaster to the trip. Scouts must be sent out to visit the prospective "jobs," to become acquainted with the management, and to estimate the condition and "worth-whileness" of the work when the visit is made. In this connection W.

F. Turnbull stated before this Society in 1922 (JOURNAL, Nov., 1922, page 147):

". . . the instructor visited each plant before hand and went over the route which the students were to follow, becoming personally acquainted with the foremen of the different departments and sections, explaining to the firm the particular object of the trip, and carrying away as much information as possible for the preliminary talk at the University. In addition certain definite questions were formulated and noted to be answered by the students in the reports. The importance of such preliminary work can hardly be exaggerated. . . ."

Civil and architectural engineering inspection trips usually require the services of a scout more than other branches of engineering because these two branches are more interested in construction work which must necessarily be in a state of change.

Information concerning places to visit can be obtained through alumni and friends and it is frequently voluntarily offered because of the interest of former students and their recollection of the value obtained from previous trips. Such information is valuable to the scout. It is unwise, however, to place reliance upon it without a visit, by an experienced faculty member, to the place recommended as the enthusiasm of the person making the recommendation may have biased his judgment concerning the general interest in the place suggested.

SIZE OF PARTY

From the viewpoint of the individual the smaller the party the better the trip. There is more opportunity to see, to hear, to learn, and to observe when with a small party than when with a large one. The nature of the visit and the ability of the guide are factors affecting the size of party which can be successfully handled. No more than five or six persons should be permitted to enter a small tunnel under compressed air but one hundred or more can successfully enjoy a harbor trip when all are on the same boat within the sound of the guide's voice and within sight of the things to be observed. In general, ten to fifteen visitors is about the maximum number who can be cared for by one guide. The success and value of the trip depend so much upon the guide that suggestions concerning the guide's qualifications should be made before the visit, if such suggestions are not likely to be considered impertinent by the prospective hosts. A good guide should know the works through which he is guiding. He should be willing to talk about them without prompting, and he should speak loudly enough to be heard. It is most exasperating to follow a tongue-

tied guide through an interesting place and to have him mumble his remarks into the nearest ear to the exclusion of ten or a dozen eager but disappointed other pairs of ears.

Transportation, hotel accommodations, food and other facilities are sometimes secured more favorably by a large than a small party. Eighty to one hundred persons can charter a railway coach, fifteen to twenty can charter a bus, two hundred may charter a special train or a boat. Some of the transportation advantages of both the large and small party can be secured by transporting the large party to the neighborhood to be visited and then breaking it up into small groups for the visits. This is the ideal arrangement.

Duration of Trip

Travelling expenses must be justified by making the trip of sufficient length to give an adequate return of information but the trip must not be of such length as to disrup normal school work in subjects not connected with the trip. The average length of trips now taken are from three to six days, although both longer and shorter trips are regularly planned at some universities. As most well-managed trips are strenuous the student is usually happy to return to the campus after three or four days of unremitting activity in the field. If the educational institution is located within a short distance of the places to be visited many short trips are more desirable than one long trip because, regardless of the excellence of the arrangements, the trip constitutes an undersirable interruption to regular instruction and difficulty is encountered with other departments in which students are registered. The interruption of school work, particularly in allied departments, generally demands that all departments absent themselves simultaneously from the campus. Interruption of studies in allied departents can be avoided where a trip is of no longer duration than one day, but three or four-day trips seldom fail to cause a student to lose time from classes in which there are students from other departments which do not participate in the trip.

Interruption of studies in other departments is not the only undesirable feature of long inspection trips. When the trip becomes too long the mind becomes fatigued so that impressions become confused, ideas cannot be absorbed, and the visitor forgets whether he saw a sewage treatment plant or an oil refinery. There seems to be a mental limit to the absorption of ideas when there is insufficient opportunity for their digestion and this limit is reached in three or four strenuous days. Beyond this period the efficiency of observation and instruction begin to be impaired.

Management and Organization

Deportment seems a sorry subject to consider where junior or senior engineering students are involved in a professional activity, yet its consideration is necessary in planning a trip. Student behavior is usually exemplary during a visit because personal pride, loyalty to the college, and interest in the place being visited are sufficient to repress ebullient spirits without admonitions from the instructor in charge. Some minor and unexpected incident can, however, so upset the gravity of a party that an embarrassing situation is suddenly created. A common cause of trouble may be a group of young women employees of a flirtatious nature or a minor accident to a member of the party. Other causes tending towards misbehavior are an uninteresting trip, boresome moments, long waits, or a fall of light, soft snow. The larger the party the greater the tendency towards rowdyism or boisterousness. Railroad cars and hotels are places to be guarded most carefully because of the relaxation permitted and the unoccupied time allowed in which horseplay can be enjoyed.

Situations leading towards breaches of discipline can be avoided by reducing the size of the party, by travelling independently in small groups, by providing a large number of instructors with the large party, and by keeping the party busy so that time and energy for activities other than those planned for the trip are limited.

Immoral behavior is a rare occurrence on inspection trips today, but in "the good old days" before the War instances were not so rare. In fact, no instances of immoral behavior involving either women or drinking are recalled which have occurred on engineering inspection trips at the University of Illinois since the War. Our largest difficulties are small ones, consisting of over-sleeping, unexcused absences, and occasionally some horseplay.

Injuries of a serious nature are rare. We leave the campus annually with 300 to 400 students for a 3½-day tour and in the last ten years or longer only two reportable accidents have occurred. In one a student was struck on the head by a falling brick receiving slight injuries which were cared for in an emergency hospital, and in the other, which had frightful possibilities, a student's head was caught in a chain conveyor. Fortunately the device was stopped quickly enough to save him from decapitation and he escaped with a few minor bruises. Warnings, pleadings, and vigilance are rewarded by a remarkable and enviable safety record.

Idleness offers opportunity for trouble which can be avoided by activity. It is, therefore, desirable to provide for the occupation of the evening hours as well as the daylight hours. Evenings can be used for travel from city to city, with alumni dinners, with

addresses by engineers of prominence in the locality, or by other group activities.

Friends, relatives, and business demands offer distractions which are sometimes difficult to overcome. "Oh, please professor, my little brother would like to go on the trip with us today. It's all right, isn't it?", or perhaps at Plant A, our guide, to whom we are much indebted for his hospitable treatment, learns that we are next visiting the works of his competitor at Plant B. He suggests that he would be most interested to go along with us. Are such requests to be refused, and if so, how? It's a delicate situation which can be handled only by the diplomacy of the instructor-in-charge. If he can cite an administrative rule which prohibits visitors from joining the party he is somewhat fortified, but the rule should not be too rigidly enforced or our welcome at Plant A might be lost, but if not enforced we might find ourselves excluded from Plant B next year. The student and his relatives are easier to manage than the self-invited guide. Where the party is not discommoded in any way there is usually no objection to permitting visitors with the party but ordinarily they are undesirable because the increase in numbers crowds transportation facilities, increases congestion, requires more guides, and presents a greater danger hazard. In general, visitors are to be avoided and discouraged.

Private business trips, shopping, and other causes for separation from the party can best be avoided by preliminary announcement that no absence from the party will be permitted except in emergency, or unless such permission is obtained before leaving the campus. No permit for absence should be granted by the party leader except in great emergency, and all absences must be made up by the student on his own time during vacation.

Under such rules requests for excused absence and "hookey playing" will be minimized.

Report or Examination

The relative values of a report or an examination on an inspection trip are difficult to determine. The examination is usually easier to give, easier to take, and easier to grade than a report, but the preparation of a report and its value as a permanent record of the trip cannot be equalled by an examination. The report should be prepared in a style which would be acceptable to a technical magazine and it should be graded on its arrangement, the use of English, the space allowed to different topics, the neatness of the drawings, choice of illustrations, and accuracy of information. Too much emphasis should not be placed upon the volume of technical details presented in the report. The preparation of a report

will furnish much-needed experience for the future engineers. The knowledge that a report is required will act as an incentive to close observation and will encourage the taking of notes, which may be neglected if only a perfunctory quiz is expected at the termination of the trip.

Note-taking during a trip is an irksome task disdained by many on the grounds that the attention is so distracted during the act of writing that points of interest are overlooked. It is possible to overdo many good things. The taking of notes is a valuable part of the visits but an attempt to secure a written record of everything seen or heard will result in a loss of many points and inefficiency in observation. The taking of photographs should be encouraged as they act as indisputable records of things seen and are invaluable as references to refresh the memory and to recall lessons learned.

Transportation, Hotels, and Cost

Cost should be reduced to a minimum with proper regard for the purpose of the trip. Judicious choice of hotels and of transportation facilities offer possibilities of minimizing costs, and it is in the reduction of costs that the advantages of a large party become evident.

For long-distance, uninterrupted travel railroad transportation offers the greatest comfort, safety, and the least cost. Competition between railroads and bus lines is so keen that it is usually possible to secure as low rates for railroad as for bus transportation. The greater comfort, safety, and reliability of railroad transportation are factors in its favor which cannot be denied. An accident on a railroad can result in no just criticism of a party choosing this method of transportation, but unjust criticism might more easily be directed at the school authorities after an accident to a bus due to incompetency of the driver, failure of equipment, or through other controllable cause.

For short-distance travel, trips involving many stops, and for transportation around a large city there is nothing that can approach the convenience of the chartered bus. By its use the party can arrange its own itinerary, make more inspections, and cover more ground than by any other means of transportation. If the itinerary requires a long journey to a large industrial center where two or three days are to be spent in sight-seeing it is sometimes more convenient and cheaper to charter busses for the entire trip rather than to attempt the longer portion of the trip by railroad and to charter busses on arrival at the center of inspection. Experience with all possible modes of transportation, with the exception of the airplane, leads to the conclusion that bus transportation in the

immediate vicinity of the places being visited, and either railroad or bus for longer hauls, is the best method for moving a large party.

The student's automobile presents a difficult problem to the instructor in charge of the party. It usually presents a hazard and a nuisance which cannot be overcome. The student prefers to drive his own car and to take his friends with him because the cost is reduced and he has a feeling of independence. The instructor does not like the use of private automobiles because of the greater possibility of accidents during the trip and because he loses control of the party. On arrival at a rendezvous there is usually a delay while awaiting the arrival of a car load delayed by traffic, a tire, or maybe to buy cokes. The difficulty can be overcome with ease and with satisfaction by the passage of a rule by the highest authorities of the college to the effect that no student cars may be used on an inspection trip, but permitting the instructor in charge to allow their use in an emergency or when they will serve the best interests of the party. Such conditions do arise, for instance, when it is desired to send a small advance group to the next place of visit to announce the arrival of the main body, or when a small group wishes to detach itself from the main party to make a special inspection.

In the selection of a hotel a limit in one direction is the desire to minimize the cost of the trip and in the other by a desire to secure the best accommodations so that the students may learn proper standards of travel. Where there is a marked choice between hotels, as there is in large cities, the decision usually rests on what might be called a moderate-priced hotel and satisfactory accommodations can be obtained for $1.50 to $1.75 per day per student. In order to obtain the most advantageous prices for a party it is well to secure quotations from a number of satisfactory hotels and to select that hotel offering the most attractive inducements.

Travel, meals, and hotels are the only items which may be properly charged to the cost of an inspection trip. Where only these items are included and the amount of travel is not a disproportionate part of the trip it is possible to keep the cost per student per day within the limits of five to eight dollars.

In conclusion, it is desirable to emphasize the instructional value of inspection trips, to point out that they are best taken preliminary to instruction, and that small groups, travelling on a well-planned itinerary, with competent guides will assure success and adequate return for the cost of the trip, whether measured in money, time, or loss of instruction along other lines.

BOOKS AND AUTHORS

A supplementary list of authors who are members of the Society has been furnished by those members whose names did not appear on the first list published in the March JOURNAL.

Author	*Book*	*Publisher*
Albert, A. L.	Fundamental Theory of Electrical Engineering	Ginn
Barrows, H. K.	Water Power Engineering	McGraw-Hill
Brown, H. A.	Radio Frequency Electrical Measurements	McGraw-Hill
Crosby, W. W.	Notes on Highway Location	Gillette Pub. Co.
Cutshall, C. S.	Graphic Statics	McGraw-Hill
Ellenwood, F. O.	Elements of Heat Power Engineering	Wiley
Fairman, S.	Graphic Statics	McGraw-Hill
Fish, J. C. L.	Engineering Economics	McGraw-Hill
	Technic of Surveying Instruments and Methods	Wiley
	Earthwork Haul and Overhaul	Wiley
	Linear Drawing and Lettering	Author
	Descriptive Geometry	Macmillan
	Coordinates of Elementary Surveying	Author
Gaum, C. G.	Report Writing	Prentice-Hall
Gwiazdowski, A. P.	Machine Shop Practice Laboratory Manual	Bare Bros.
	Economics of Tool Engineering	McGraw-Hill
Hirshfeld, C. F.	Elements of Heat Power Engineering	Wiley
Jackson, D. C.	Textbook on Electromagnetism and the Construction of Dynamos	Macmillan
	Street Railway Fares	McGraw-Hill
Mantell, C. L.	Industrial Carbon	Van Nostrand
	Tin, Its Mining, Production, Technology and Applications	Chemical Catalog Co.
Reynolds, Jos. B.		
Steinman, D. B.	Suspension Bridges	Wiley
	Concrete Arches, Plain and Reinforced	Wiley
	Theory of Arches and Suspension Bridges	McGraw-Hill
	Suspension Bridges and Cantilevers	Van Nostrand

MEMBERS IN ENGINEERING SCHOOLS AND COLLEGES

Institution	Members Nov. 3, 1931	Applications Received after Nov. 3, 1931
Akron, Univ. of	9	
Alabama Poly. Inst.	13	
Alabama, Univ. of	2	
Alberta, Univ. of	3	
Antioch College	2	1
Arizona, Univ. of	8	
Arkansas, Univ. of	11	
Armour Inst. Tech.	27	
Beirut, Univ. of (Syria)	1	
Bombay C. E. College	1	
Bradley Poly. Inst.	2	
Brazil-Poly. School of State	1	
British Columbia, Univ. of	4	
Brooklyn Poly. Inst.	21	
Brown Univ.	9	
Bucknell Univ.	13	
Buffalo, Univ. of	1	
Butler Univ.	1	
Calif. Inst. Tech.	8	
Calif., Univ. of	15	
Calif., Univ. of So.	6	
Carnegie Inst. of Tech.	14	1
Case School of Applied Science	29	
Catholic Univ.	1	
Cincinnati, Univ. of	6	2
Clarkson College	8	
Clemson College	10	
Colby College	1	
Colorado Agri. College	6	
Colorado School of Mines	10	
Colorado, Univ. of	19	2
Columbia University	28	2
Connecticut Agri. College	1	
Cooper Union	14	
Cornell University	28	1
Cornell College	1	
Dartmouth College	4	
Dayton, Univ. of	6	1
Delaware, Univ. of	8	
Denison Univ.	2	
Denver, Univ. of	1	
Detroit University	14	1
Drexel Institute	8	
Duke Univ.	7	
Duluth Jr. College	2	1
Ecole Polytechnique	7	
Ely Jr. College	1	
Escuela Centrale de Ing. Ind.	1	
Evansville College	3	
Fenn College	12	
Florida, Univ. of	7	
Franklin and Marshall	1	
Franklin Union	2	
Fresno Teachers College	0	1
General Motors Inst.	5	
George Washington Univ.	3	
Georgia Inst. of Tech.	15	
Gettysburg College	2	
Ghent, Univ. of	1	
Girard College	1	
Harvard University	16	
Haverford College	2	
Hawaii, Univ. of	3	
Howard Univ.	3	
Idaho, Univ. of	12	2
Illinois, Univ. of	54	
Indiana Univ.	1	
Iowa State College	38	
Iowa State University	23	2
James Millikan Univ.	2	
John Tarleton Agri. College	1	
Johns Hopkins Univ.	3	
Joliet Jr. College	1	
Kansas State College	42	1
Kansas, Univ. of	18	1
Kentucky, Univ. of	10	
Lafayette College	12	2
Lawrence College	1	
Lehigh Univ.	15	
Leningrad Poly. Inst.	1	
Lewis Inst.	1	
La. Industrial Inst.	1	
La. Southwestern Inst.	2	
La. State Univ.	2	
Louisville, Univ. of	16	
Lwow, Poly. of	1	
Maine, Univ. of	21	3
Manhattan College	7	
Marine Union Jr. College	1	
Marquette Univ.	10	
Marshall College	1	
Maryland Univ. of	1	
Mass. Agri. College	1	
Mass. Inst. Tech.	45	6
McGill Univ.	9	
Mechanics Inst.	2	
Mercer College	1	
Mexico, Univ. of	2	
Michigan College Mines	5	

Institution	Members Nov. 3, 1931	Applications Received after Nov. 3, 1931
Michigan, Univ. of	47	
Michigan State College	11	
Minnesota, Univ. of	70	6
Mississippi A. & M.	4	
Missouri School Mines	10	
Missouri, Univ. of	17	1
Modesto Jr. College	1	
Montana School of Mines	11	
Montana State College	3	
Mt. Allison Univ.	2	
Nanking Tech. College	1	
Nebraska, Univ. of	24	
Nevada, Univ. of	3	
Newark College of Eng.	13	
New Hampshire, Univ. of	11	
New Mexico A. & M.	3	
New Mexico School Mines	1	
New Mexico, Univ. of	3	
New York, College of City	7	1
New York Univ.	18	2
North Carolina State College	9	2
North Carolina, Univ. of	11	
North Dakota, Agr. College	3	1
North Dakota, Univ. of	4	
Northeastern Univ.	20	1
Northwestern Univ.	7	
Notre Dame, Univ. of	1	
Norwich Univ.	3	
Nova Scotia Tech. College	1	
Ohio No. Univ.	2	
Ohio Mechanics Inst.	2	
Ohio State University	56	
Ohio University	1	
Oklahoma A. & M.	13	
Oklahoma, Univ. of	7	1
Oregon State College	16	
Oregon Inst. Tech.	1	
Pasadena Jr. College	4	
Pei Yeng Univ.	2	
Penna. Military College	2	
Penna. State College	37	
Penna., Univ. of	15	1
Philippines, Univ. of	1	
Pittsburgh, Univ. of	26	
Porto Rico, Univ. of	3	
*Pratt Institute	33	4
Princeton University	12	
Purdue University	87	2
Rensselaer Poly. Inst.	13	
Rhode Island State College	5	
Rice Institute	7	
Rindge Tech. School	1	
Riverside Jr. College	1	
Robert College	5	
Rochester, Univ. of	3	
Rose Poly. Inst.	9	
Royal Poli. (Italy)	0	1
Rutgers Univ.	14	
St. Thomas, College of	1	
Santa Clara, Univ. of	1	
Saskatchewan, Univ. of	2	
South Carolina, Univ. of	1	
South Dakota School Mines	11	
South Dakota State Coll.	2	
South Dakota, Univ. of	3	1
Southern Methodist Univ.	5	
Stanford University	14	
Stevens Inst. Tech.	13	1
St. John's Univ.	1	
*Swarthmore College	6	
Syracuse Univ.	14	
Tangshan Univ.	1	
Tennessee Poly. Inst. of	2	
Texas Agri. College	2	
Texas A. & M.	23	1
Texas College of Arts	1	
Texas College Mines	1	
Texas Tech. College	14	
Texas, Univ. of	12	
Toledo, Univ. of	4	
Toronto, Univ. of	9	
Trinity College	1	
Tufts College	18	
Tulane University	9	
Tulsa, Univ. of	1	
Union College	10	
U. S. Military Academy	3	
U. S. Naval Academy	7	
Utah Agri. College	2	
Utah, Univ. of	9	
Valparaiso Univ.	1	
Vanderbilt University	5	
Vermont, Univ. of	10	
Villanova College	1	
Virginia Military Inst.	7	
Virginia Poly. Inst.	15	
Virginia, Univ. of	13	
Washington State Coll.	9	
Washington Univ. (St. Louis)	13	3
Washington, Univ. of	16	
Wentworth Institute	5	
West Virginia Univ.	10	
Wisconsin, Univ. of	34	
Worcester Poly. Inst.	27	
Wyoming, Univ. of	7	
Yale University	38	

* Faculty 100% members of S. P. E. E.
130 new members this year.

Return to the Secretary, F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Society for the Promotion of Engineering Education

Date.....

THE UNDERSIGNED desiring to become a member of

THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION

hereby agrees to conform to the requirements of membership, if elected and submits the following:

STATEMENT OF QUALIFICATIONS

Full Christian Name and Surname.....
Print Last Name First Middle

Mailing Address (Number and Street).....

Post Office (City and State).....

Full Title of Professional Position.....
(Title) (Department)

Full Name fo Institution.....

(To be Signed by Two Sponsors).....

SPONSORS { .....
.....

AN INTERESTING SIDE LIGHT ON THE WORK OF THIS SOCIETY

Dear Sir: I am sending the pay for the JOURNAL, as per inclosed bill, and of course in due time the check will be returned to me and that will serve as my receipt.

I am a Medical Officer in the U. S. Army stationed here, and of course being a Doctor you may wonder why I am buying the JOURNAL. The explanation is that I have a son who is now a student at the . . . . . Academy (3d yr.), and he has had some idea of studying for one of the engineering professions.

I have bought most of the bulletins that have been put out by the Society, and have read the Carnegie report on engineering education. I have found much to interest me, and I have got an idea of the situation as I never could have gotten it otherwise. I don't want him to go into something blindly, but want him to have a clear idea of what his objective is to be, and then if he decides to go to an engineering school, to go there with his eyes open, and with the proper preparation. Likewise to have a clear idea of his own capacity, as well as select the variety of course that is suited to his talents, and aptitudes.

He will have one more year to go to . . . . and it is not decided if he will finally go into engineering. I have read the bulletin on Technical Institutes. At the present time as I gather that the schools all over the country have been able to place but 25 per cent of their graduates the present outlook for the oncoming boys is not any too good. That refers to those that graduate, after the elimination of the 60 per cent that fail. Is it not true that the prospects for the parents are rather gloomy? We look forward to putting out savings of about at least $5,000 to say nothing of the time involved. One does not do this if they think they are not to be able to use the knowledge to advantage.

From my reading and from my experience in life (55 yrs.), 26 as a Doctor, it seems to me that there is in the U. S. room for 75 high class engineering schools, that would take the best talent, and train a high class of talent; that the boys that are now attending the other 75 per cent of the present schools may be the ones that would do better in the Technical Institutes, to recruit the 40,000–50,000 graduates that are said to be needed by industry. It may possibly be true that a large number of the present boys, in a large number of the present schools, will finally be doing the exact type

of work that they could have done with the present 2 yr. Technical Institute training.

My general impression from reading all the bulletins, as an outsider, is that there are at present a large number of engineering schools, parts of State Universities and otherwise, who are offering a four years' course that may possibly be on a somewhat lower plane as regards entrance requirements, equipment, and faculty than possibly a few of the best, and strongest schools.

At any rate while the expense has been small I have had a lot of wholesome information, from those within the family circle, and has been illuminating and instructive. If my son does go into engineering he can at least say that he did it with his eyes open.

ADDITIONS TO THE PRELIMINARY PROGRAM

In addition to the conferences listed in the preliminary program now in your hands the following conferences are scheduled:

Machine Design, Frank L. Eidmann, Chairman.

Qualifications of a Teacher of Machine Design.

The Ideal College Course for a Machine Designer—from the Viewpoint of an Employer.

Mechanics, A. P. Poorman, Chairman.

SECTIONS AND BRANCHES

The **Case School of Applied Science Branch** recently discussed the subject of curriculum building on the basis of functional specialization. At this meeting, held at the Case Club on March 15, Mr. L. A. Trofimov, Development Engineer for the Electric Controller and Manufacturing Company of Cleveland, was the main speaker. He called attention to the increasing tendency of industry to disregard the dividing lines between electrical, mechanical, civil and other of the traditional subject-classes among engineers, and made a plea for the reorganization of the college curriculum into five functional divisions. These divisions were research, development, production, sales, and service, corresponding respectively to: (1) Obtaining of basic information, (2) applying this information to the product, (3) multiplying the product, (4) adapting the product to public use, and (5) using the product.

One well-chosen point favorable to the functional curriculum is its advantage to the student in his selection of a course of study. The fact was emphasized that there is an emotional difference between such functions as research and selling, and that the student is sure of his own preference between such functions. Mr. Trofimov also appealed to colleges to make more use of the time-saving methods and mechanical aids which have been so widely adopted in the industrial drafting room, office and laboratory.

In the discussion the point was made that there is already a degree of functional specialization in certain of our curricula, but that such specialization had best be deferred to the fourth year. Municipal engineering and certain other fields do not call for functional specialists. Better facilities for the preparation of the teacher would be required for functional program, and in this we need the coöperation of industry and of the national engineering societies.

The time of meeting of the **Maine Branch** has been changed from 4:15 P.M. to a luncheon meeting. This time does not conflict with laboratory classes and has increased the attendance.

The officers elected for 1931–32 are:

Prof. W. J. Sweetser, *Chairman,*
Prof. I. H. Prageman, *Secretary.*

At the January meeting Prof. Harry D. Watson spoke concerning the teaching methods of the Harvard Engineering School. Professor Watson attended classes at Harvard during a half year sabbatical leave in 1931.

At the March meeting Prof. Weston S. Evans gave an account of Freshman Personnel Work at the University of Maine. Professor Evans has had charge of this work for the last two years. His account of the problems encountered was very instructive.

We are planning to have at least six meetings during the college year.

I. H. PRAGEMAN, *Secretary.*

The **Middle Atlantic Section** of the S. P. E. E. will hold its annual spring meeting at Swarthmore College on May 7.

CHAS. G. THATCHER,
Chairman, Division of Engineering.

COLLEGE NOTES

Massachusetts Institute of Technology.—For purposes of administration the curriculum has been divided into five branches—School of Science, School of Engineering, School of Architecture, Division of Humanities and Division of Industrial Coöperation. Dr. Vannevar Bush, Professor of Electrical Engineering, has been appointed Vice-President and Dean of Engineering. Dr. Samuel C. Prescott, Head of Department of Biology and Public Health, has been made Dean of Science. Professor William Emerson, Head of Department of Architecture, has been made Dean of Architecture. The new distribution is made in accordance with the five major aspects of the work. The three schools are made up of the departments in which degrees are given, and the two divisions are made up of those departments and courses which are conducted for the purpose of giving a student the further cultural training and background necessary to equip and train him to solve the various engineering and administrative problems of industry.

Dr. Clair E. Turner, Professor of Biology and Public Health at the Massachusetts Institute of Technology, has been selected to act as chairman of the Health Section of the World Federation of Education Associations which will convene at Honolulu next July. Dr. Turner has also been appointed to the faculty of the University of Hawaii for the summer session during which he will offer a course for teachers of health education.

Northeastern University.—Professor Wilfred S. Lake, a member of the Department of Economics in the Day Division since 1926 and acting-chairman during the past school year, has been appointed head of the department beginning in September, 1932.

Enrolment in the School of Engineering for the current school year is approximately the same as that for 1930–31. The distribution by curricula for 1931–32 is as follows: Civil Engineering, 375; Mechanical Engineering, 311; Electrical Engineering, 422;

Chemical Engineering, 296; and Industrial Engineering, 142—Total, 1,546.

For those coöperative students who are unemployed because of the industrial depression the University has planned a program of electives in the field of liberal arts. During the alternate five week periods when they would normally be at work, such students may select courses from the following fields of study: (1) Natural Sciences, (2) Education, (3) Literature, (4) Philosophy, (5) History and Government, (6) Psychology and Sociology. An adjustment of tuition has been arranged to make it possible for students who are not assigned to coöperative work to take these cultural courses without additional cost.

NECROLOGY

FREDERICK LANE HUTCHINSON

Frederick Lane Hutchinson was born at Elizabeth, N. J., April 2, 1866; graduated from Cornell University, 1893; with the Westinghouse Electric & Manufacturing Company from 1893 to 1901; became an Associate of the Institute in 1894; manager of publications for the C. W. Hunt Company of New York, 1901–2; advertising manager for the National Electric Company of Milwaukee, 1902–3; sales manager for the same company, 1903–4; took up special work on the Institute *Transactions* in 1904; appointed Assistant National Secretary in 1908; became National Secretary in 1912; transferred to grade of Member of the Institute, 1913; married Grace Lawrence Duryee of San Diego, Calif., June 27, 1921; represented the Institute at the World Power Conference, London, 1924, and at the World Engineering Congress, Tokyo, 1929; died Friday, February 26, 1932.

The Executive Committee of the American Institute of Electrical Engineers adopted the following resolution:

WHEREAS: The death of Frederick L. Hutchinson has removed from the American Institute of Electrical Engineers one of its most devoted members and a leader of marked ability and high ideals,

WHEREAS: During his service of twenty-eight years as a member of the staff, including twenty years as national secretary, he worked unceasingly and effectively for the best interests of the membership and the advancement of the entire engineering profession, exhibiting at all times remarkable enthusiasm, unselfishness, and wisdom,

WHEREAS: His delightful personality, his deep interest in the wide range of activities of the Institute and organizations with which it coöperated, his keen grasp of all questions involved, and his unfailing tact on all occasions, won the respect and admiration of a multitude of friends, be it therefore

Resolved: That on behalf of the membership, the executive committee hereby expresses its profound sorrow at the death of one of the Institute's

outstanding leaders, and extends to the members of the family of Mr. Hutchinson its deepest sympathy, and be it further

Resolved: That these resolutions be inscribed in the minutes of the Executive Committee and a copy be transmitted to the members of Mr. Hutchinson's family.

EDWARD ORTON, JR.

Edward Orton, Jr., was the son of Dr. Edward Orton and Mary Jennings Orton and was born at Chester, N. Y., October 8, 1863, and died February 10, 1932. He was taken to Yellow Springs, Ohio, when his father became principal of the preparatory school in 1865, and later President of Antioch College. In 1877, he entered the preparatory department of the Ohio State A. & M. College, of which his father was the first president, and received the degree of Engineer of Mines in 1884. From 1884 until 1894 he was employed as chemist and superintendent of iron and coal mines and of blast furnaces and paving brick factories. In 1892–3 he revised the report on the clays of Ohio which he had prepared as a junior undergraduate student. The lack of technical information and literature on the subject of clays caused him to draft a bill which became a law on April 20, 1894, requiring the Board of Trustees of The Ohio State University to establish a department of ceramics, equipped and designed for the technical education of clay-, cement-, and glass-workers. His bill specified what was to be taught, and included appropriations for equipment, salary, and supplies. On July 1, 1894, he became the first director and professor of ceramic engineering in the world and thereby originated a new branch of education. The degree of "Engineer of Mines in Ceramics" was first conferred in June, 1900.

He became Secretary of the College of Engineering of The Ohio State University in 1895, was Dean of the College from 1902 to 1906 and again from 1910 to 1915. As dean, he took an active part in the advancement of the University, as well as the College of Engineering, in the building programs, the establishment of the engineering experiment station in 1913, the establishment of the summer school under the University's control, and of the graduate school. He obtained a year's leave of absence in 1915–16 and attended the first Plattsburgh Training Camp. In May, 1915, he was elected research professor in ceramic enginering, but resigned in May, 1917, when he entered the military service of the United States. He founded the American Ceramic Society in 1899; was its secretary until 1916, and was its president in 1930–31.

From 1899 until 1906, he succeeded his father as State Geologist of Ohio. On September, 1918, he was commissioned Lieutenant Colonel and received the Distinguished Service medal from

Congress on June 2, 1919. He was commissioned a Brigadier General in the Quartermaster's Reserve Corps on September 27, 1923.

As a citizen he gave his time and money freely to charitable, philanthropic, and civic organizations. He founded "Camp Mary Orton" and presented it to the trustees of the Godman Guild, of which he was sceretary. He founded the Edward Orton Memorial Library in honor of his father in 1919–20, supported it during his life, and endowed it in his will. In 1896, he began the manufacture of pyrometric cones for regulating the firing process of ceramic products. In 1900, he developed the laboratory and testing station for the study of clay and ceramic products. More recently he established the Orton Memorial Laboratory and bequeathed it to the Edward Orton, Junior, Ceramic Foundation, which will be operated for the benefit of the ceramic engineering profession under the direction of the Board of Trustees representing the American Ceramic Society, The Ohio State University, and the Bureau of Standards.

He received the degree of Doctor of Science from Rutgers College in 1922, the honorary degree of Doctor of Laws from Alfred University in 1931, and the professional degree of Ceramic Engineer from The Ohio State University on June 8, 1931.

J. HAMMOND SMITH

Professor J. Hammond Smith, head of the department of civil engineering, University of Pittsburgh, died April 13, 1932.

Professor Smith was born in Wellsville, Ohio, October 14, 1867. He graduated from the University of Pittsburgh, school of engineering in 1898, and took post graduate work at Cornell. Coming back to Pitt that same year, he was made superintendent of the shops of the engineering school, and professor of drawing in 1900. Since 1909 he has been professor and head of the department of civil enginereing. During that time the department has increased in membership from a very small number to an enrollment of about 130. He has been consulting engineer to a number of Pittsburgh's prominent industries. He was the author of many papers on engineering and photo-sculpture, and a recognized authority on photo-sculpturing, to which process he made many contributions.

HARTMAN, F. M., Dean, Schools of Engineering, Professor of Electrical Engineering, Cooper Union, died March 30, 1932. Member since 1908.

LANDRETH, OLIN H., 140 Park Avenue, Mt. Vernon, New York, N. Y., charter member of the Society; Vice-President, 1908–09; Member of Council, 1892–5; 1901–4.

The T-SQUARE PAGE

DEVOTED TO THE INTERESTS OF THE DIVISION OF ENGINEERING DRAWING

FREDERIC G. HIGBEE, EDITOR

A Competition in Drawing.—At the Corvallis meeting the Division of Engineering Drawing will hold a competition and exhibit of student work. The competition is to be limited to drawings made by students in the *first* course in engineering drawing and the work must be submitted in blue print form. Twelve prints of each drawing must be in the hands of the editor before June 15, 1932; one print of each drawing is to be exhibited, judged by a committee, and awarded honors. The remaining prints will be made up into a circulating exhibit and sent about to all those who submitted work in the competition. The purpose of this competition is not only to stimulate interest in engineering drawing and to award honors to outstanding draftsmen, but also to provide the committee with adequate material for planning future exhibits and competitions.

Engineering departments teaching first year drawing are urged to submit work immediately after the conclusion of the course. Union College has already entered its drawings and others have signified their intentions of exhibiting student work.

Corvallis Meeting.—Program for meeting:

Wednesday, 6:00 P.M. Divisional Dinner

Discussion topic: "A Competition in Engineering Drawing"

A general discussion of the possibilities and methods to be employed for such a project.

Friday, 2:30 P.M.

General topic: "What Constitutes a Practical Problem in Descriptive Geometry"

(a) Can the practical drawing problem of engineering drafting be made to carry the theoretical principles of descriptive geometry?

(b) What material may be introduced as reference in a pure descriptive course to convince the students of its practicability?
Messrs. F. M. Warner, The University of Washington; G. W. Holcomb and Fred Merryfield, The Oregon State Agricultural College.

(c) Discussion.

Special Meeting.—In accordance with plans now being perfected by Professor H. M. McCully, chairman of the Division of Engineering Drawing, a meeting of the engineering drawing division is contemplated at Ohio State University early in May. A discussion of matters of interest to engineering drawing teachers will be included in the divisional meeting.